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Congestion Management System

1998

Transportation Planning Division
Data & Statistics Bureau

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1998 CMS Report

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MDT Montana Department of Transportation

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Overview

There were no unanticipated results in the 1998 CMS analysis. That's not to say there weren't changes. The expansion of the urban limits shorted the rural portion of the following routes:

Billings	**Bozeman**
Secondary	Secondary
S-302	S-205
S-429	S-412
NI-NHS	S-235
P-53	

The changes in route lengths affected the route's overall CI, some positively, others negatively, as is evident in the individual route tables listed for each system.

Also note:
S-528 - Added to Secondary System (McCone county)
S-510 - Dropped from Secondary System (McCone county)

The following table provides a quick reference of the state's overall congestion indices by system. The table shows a comparison of the 1996, 1997 & 1998 CIs to the projected CIs.

Statewide Systems' Congestion Indices

System	1996 Existing	1997 Existing	1998 Existing	1998 E+C*	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
Interstate	94	94	94		93		91		90		88	
NI-NHS	76	76	76	76	74	75	72	73	70	71	67	68
Primary	80	80	80	80	78	79	77	77	75	76	74	74
Secondary	87	87	92	93	92	92	91	91	91	91	90	90
State Highways	N/A	N/A	89	89	89	89	88	88	87	87	86	86

* Existing plus Committed Network
Shaded cells indicate there are no capacity enhancing projects for this system.
1996 & 1997 traffic data is not available for State Highways

The following table illustrates the percent of miles by system in each of the level of service ranges. The percents compare the current traffic year, 1998, to the projected traffic years in five year increments.

Percent of Miles by Level Of Service

		System									
		Interstate		NI-NHS		Primary		Secondary		State Highways	
		1998	2018	1998	2018	1998	2018	1998	2018	1998	2018
Level of Service	A	98.2	76.5	39.3	28.5	42.5	33.1	83.3	76.7	68.5	62.8
	B	1.8	19.1	29.3	25.3	36.4	32.7	13.5	17	26.0	26.4
	C	0	4.4	20.8	21.8	14.1	19.7	2.7	4.0	5.5	7.5
	D	0	0	8.7	11.5	5.4	7.2	.5	2.0	0	3.3
	E	0	0	1.9	10.6	1.6	7.0	0	.3	0	0
	F	0	0	0	2.3	0	.3	0	0	0	0

Other changes to note:
The unacceptable CI level, or 'hotspot' indicator, was modified on the Interstate System to less than 70 (LOS <B). This was done to correspond with the CI threshold being used in the Investment Analysis Plan and the Needs Study.

The unacceptable CI level for the other systems remained at less than 55 (LOS <C).

Rural Corridors

CMS Definition

The Congestion Management System, or **CMS,** is a database that is processed by several techniques (both automated and manual) to produce congestion indices **(CIs)** for Montana's "on-system" roads. The CMS measures the current and, in the case of the rural corridors, future (predicted) "operational health" of the highway systems.

On the rural highway corridors, CIs consist of point values ranging from 0 – 100 and are a numerical representation of the levels of service (LOS). Numerical ranges were developed 1) to accommodate the input for CMS equations and 2) to identify any analysis segment/corridor's relative position within a LOS range.

The following table represents the CI range for each LOS.

LOS	CI RANGE
A	**85 – 100**
B	**70 – 84**
C	**55 – 69**
D	**40 – 54**
E	**25 – 39**
F	**0 – 24**

There are six levels of service defined for each type of facility (i.e. two-lane, multi-lane, and freeway). These LOSs are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions. The definitions for these ranges vary based on the type of facility being analyzed, but following are *general* definitions of the operating conditions that exist at each level.

LOS A – Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Almost no platoons are observed.

LOS B – The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. Minor disruptions are still easily absorbed at this level.

LOS C – Freedom to maneuver within the traffic stream is noticeably restricted. There are noticeable increases in platoon formation, platoon size, and frequency of passing impediments. Minor disruptions may be expected to cause serious local deterioration in service, and queues may form behind any significant traffic disruption.

LOS D – Freedom to maneuver is more noticeably limited and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing because the traffic stream has little space to absorb disruptions.

LOS E – Roadway is operating at capacity. Operations at this level are volatile there being virtually no usable gaps in the traffic stream.

LOS F – Describes breakdowns in vehicular flow.

Congestion Definition

Currently the Department is working on developing Performance Objectives for each of the highway systems, excluding local roads. There are numerous objectives, one of which is determining acceptable level of service thresholds. These thresholds vary based upon the system, i.e. the acceptable level of service on the Interstate is not be the same as it is on the other systems. The acceptable LOS thresholds have been applied and the "hot spot" maps have been adjusted to reflect the new thresholds.

Highway Systems Addressed in the CMS

The CMS analyzes the Interstate, Non-Interstate National Highway System (NI-NHS), Primary, Secondary, State Highway, and Urban Systems. These roadways comprise approximately 11,740 miles of Montana's 69,663-mile public road system. While these roadways make up only 17% of total public road miles, they carry more than 75% of the statewide total vehicle miles of travel. It can safely be assumed the vast majority of the congestion that does occur, occurs somewhere on these systems.

For each of these systems, analysis is stratified further into the rural and urban environments. Within these environments, analyses are conducted on each system in its aggregate, by route, by corridor, by route segment. Additionally, CMS analyses are conducted by functional class groups, **but only on the highway systems described above**. The functional class groups consist of principal and minor arterials, major and minor collectors, urban collectors, and local roads.

CMS Uses

MDT's CMS is the first step in the management of congestion in that it provides the information necessary for reactive congestion mitigation actions as well as enabling MDT to be pro-active in preventing future congestion.

While CMS reflects a significant step forward in measuring the "operational health" of Montana's highway infrastructure, MDT and local governments have not dismissed congestion issues in the past. There are seven urban area comprehensive transportation plans which, in part, analyze roadway and intersection capacity issues in each respective area.

Forecasting Abilities

In addition to measuring current year congestion indices, the CMS can predict or forecast future CIs on the 11,000+ miles of rural highways included as part of the analysis. Forecasting is accomplished in five year increments for twenty years. For the purpose of this 1998 CMS summary report, the forecast years are 2003, 2008, 2013, and 2018.

Highway Network Analyses

The CMS analyzes two types of highway networks for the rural corridor portions of the highway systems. The "**Existing**" highway network reflects the highway attributes and geometrics as they currently exist. Current and forecasted traffic volumes are assigned to the "**Existing**" system to determine the current CI as well as the effect of anticipated traffic growth on the highway systems if no improvements were made. The "**Existing plus Committed**" **(E+C)** network includes the existing highway attributes and geometrics plus those from any projects in the STIP that would affect the capacity of a highway. The STIP projects are the "committed" portion of the E+C analyses. By analyzing the E+C networks, the effect of planned projects on congestion can be determined before they are constructed.

CMS Performance and Reporting Timeframes

The CMS report will be updated annually after the previous year's traffic data has been processed and is available for use. As the updated TIS images become available throughout the year, the on-system routes will be re-inventoried and the CMS database updated.

All previous years' CIs will be tracked in each CMS report. This will allow tracking of the actual performance of Montana's highway systems over time.

Analysis Techniques

The CMS utilizes the capacity analysis techniques in the third edition of the ***TRB Highway Capacity Manual*** (HCM).

Data Sources

Information used in the CMS is gathered from the TIS Roadlog, TIS Traffic file, MDT digital image viewer, and field inventories.

Data Items

Data items used in the CMS include lane widths, shoulder widths, no passing zones, terrain types, surface types (paved vs. unpaved), traffic volumes by vehicle type, median types, lateral clearances, number of lanes, and directional distribution of vehicles. To accommodate other non-CMS needs within MDT, access points and rumble strip location data was also collected.

Miscellaneous CMS Capabilities

This summary report contains general information about the "operational health" of the highway systems. However, the CMS is capable of generating information not related to congestion indices themselves. For example, the CMS can be queried to identify the roads which have specified shoulder widths, those that have travel lanes of specified widths, rumble strip locations, terrain types, etc. The query type possibilities are limited only by the data types contained in the system.

CMS Limitations

Inherent in the design of the CMS are analysis capabilities at the route segment level. On the rural systems alone, there are in excess of 26,600 analysis segments. With information this detailed, there is an occasional tendency toward assuming it is of project design level quality. However, the CMS was designed as a systems-level planning tool and should not be considered for use at the project design level.

CMS History

Congestion Management Systems, by whatever name given them, are not new to the world of transportation. They have been in service in different forms in some of the more populous areas for many years. Many of these systems' geneses may have resulted out of necessity, being reactive rather than proactive in nature. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) required each state to develop six management systems, one of which was a CMS. On July 20, 1995, FHWA issued a memorandum which included preliminary indications that the requirement for the management systems may be reduced or eliminated. In response to staff concerns, the MDT Director's office issued an August 30, 1995 memorandum stating support for the continued development/enhancement of all six systems, regardless of whether or not the requirements would be reduced or eliminated. (The federal requirement for the systems was officially dropped on November 28, 1995).

The CMS is only the first step in congestion management. It provides the information necessary to assess the current and future operational health of Montana's highway system. Armed with this information, MDT planners, engineers, program developers, and the public can determine the best course of congestion mitigation/prevention actions on our highways.

CMS Development Status
(as of October 1999)

The 1998 CMS summary report includes results on all available rural corridors on the Interstate, NI-NHS, Primary, and Secondary and State Highway systems.

Corridors in the urban and urban-like areas have been identified and while some information is available, significant amounts of data collection remains to be done. Further details are included in each specific section of this report.

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Notes

Rural Interstate System

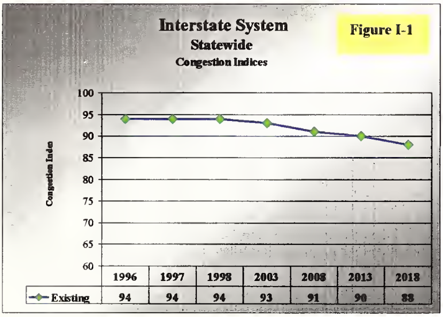
General Information

Because of the high-level controlled access design features of the Interstate System, the entire system was analyzed using only the rural freeway capacity analysis techniques. It was not considered necessary to utilize any other techniques where the Interstate System passes through urban areas.

Existing Network

As illustrated in **Figure I-1**, the overall, statewide existing network CI is currently 94 (LOS A) and, as expected will not fall below a CI of 88 (LOS A) within the next 20 years. The CI (94) remained constant throughout 1996, 1997, and 1998.

Figure I-1



E+C Network

The E+C Network consists of the existing highway infrastructure plus any capacity enhancing projects in the most current STIP. In the case of the Interstate System, there are no planned projects that would enhance the LOS. Therefore E+C Network CIs were not calculated for the Interstate System.

Individual Interstate Routes

Figure I-2 illustrates the Existing and E+C network CIs by individual routes.

Figure I-2

Route No	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
I-15	96	96	96	▨	95	▨	95	▨	94	▨	93	▨
I-90	91	91	91	▨	89	▨	87	▨	85	▨	82	▨
I-94	96	96	96	▨	95	▨	95	▨	95	▨	94	▨
I-115	97	97	96	▨	96	▨	95	▨	95	▨	94	▨
I-315	79	80	81	▨	76	▨	71	▨	65	▨	59	▨

Those CI's in red reflect congestion indices of LOS C or lower (CI <70)

Note: All Interstate routes are considered as 100% rural

[1] Traffic year

[2] Existing Highway Network

[3] Existing plus Committed Highway Network

▨ No capacity enhancing projects planned for these routes

District Comparisons

Figures I-3 through **I-8** (see page 5) compare the overall Interstate system CIs in each of the Districts.

Figures I-9 through **I-13** (see pages 6-10) are maps which illustrate CIs on the existing highway network for the entire Interstate system for the years 1998 through 2018 in five-year increments.

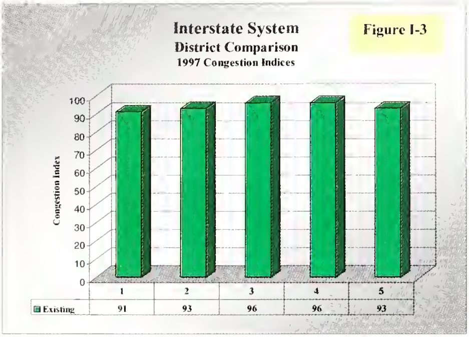
Hot Spots

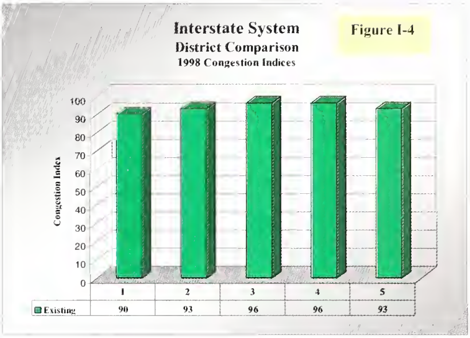
In the 1997 CMS report, any segment with a LOS less than C was identified as a hotspot. With the recent implementation of the Investment Analysis Plan, the Department has tentatively adopted an 'acceptable level-of-service' for each of the systems. The only system that had a threshold change was the Interstate. The Department's acceptable standard for the Interstate System is now a CI greater than 69 (LOS B and above).

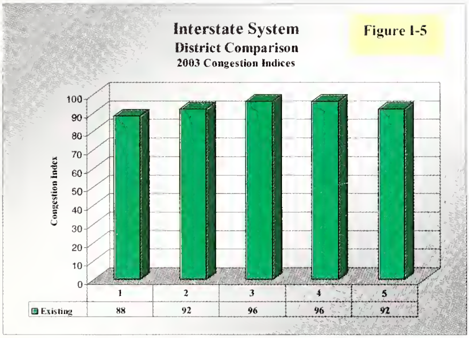
Figures I-14 and **I-15** (see page 11) have been developed to better illustrate segments of the Interstate that currently have, or are projected to have, service levels of less than B (LOS < 70).

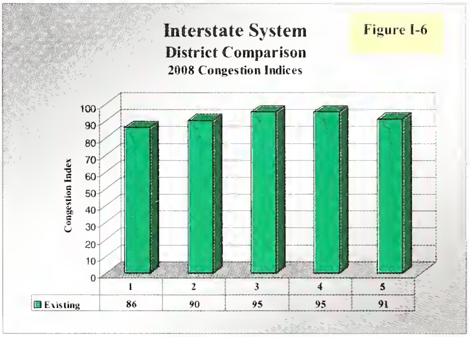
Figures I-16 and **I-17** (see page 12) compare the total number of miles of Interstate in each District against the numbers of miles of Interstate operating below a CI of 69 (less than LOS B).

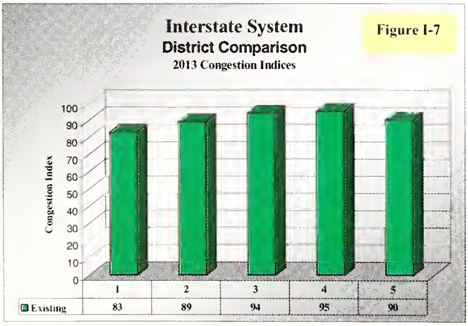
Rural Interstate System











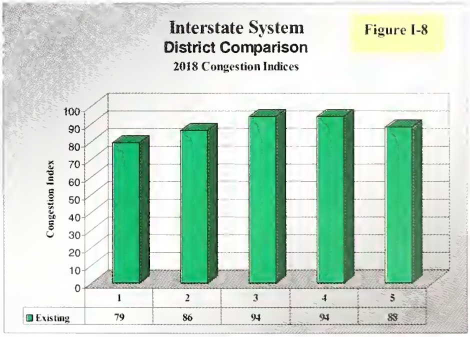
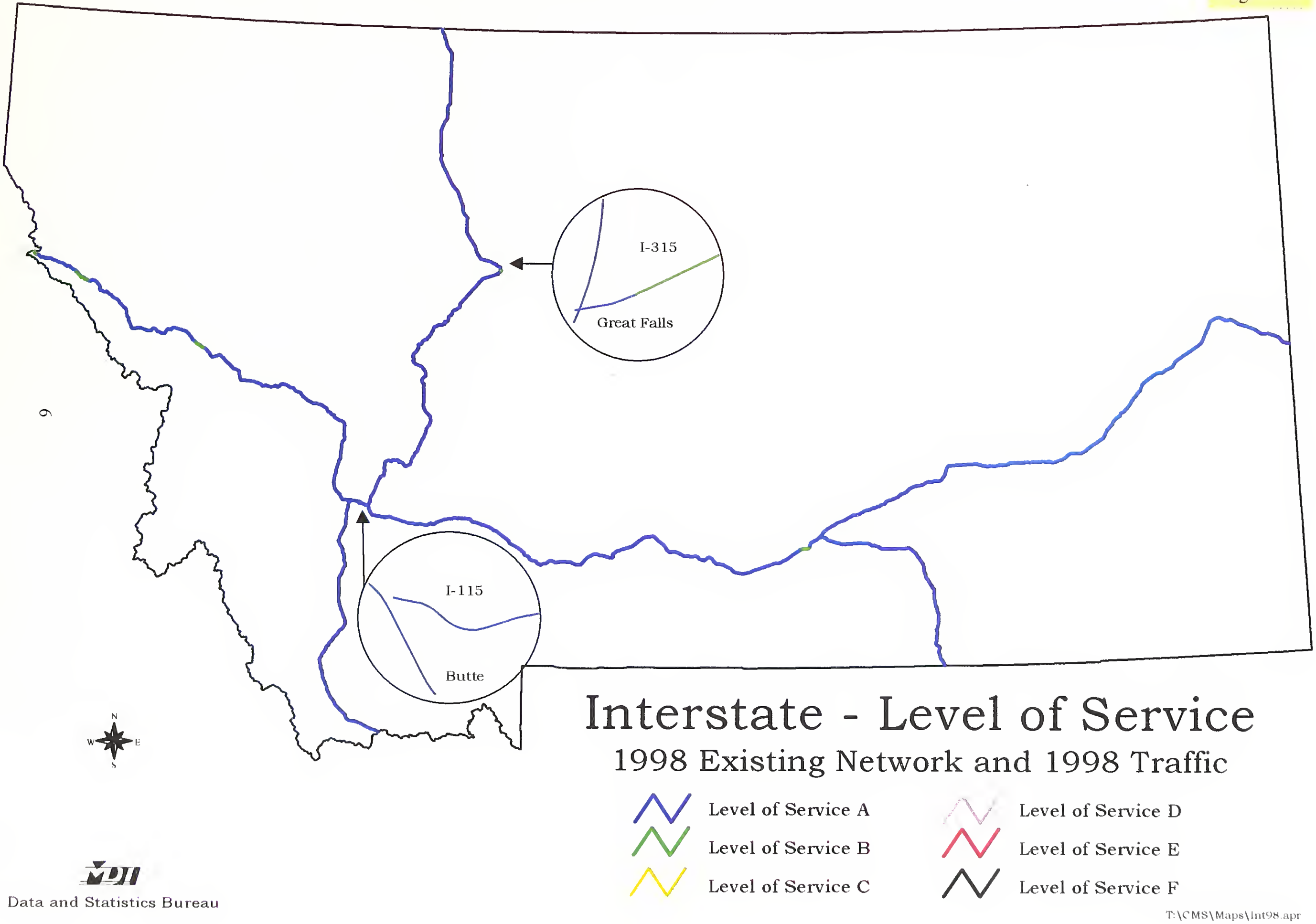


Figure I-9



Interstate - Level of Service

1998 Existing Network and 1998 Traffic

Figure I-10

Interstate - Level of Service

1998 Existing Network and 2003 Traffic

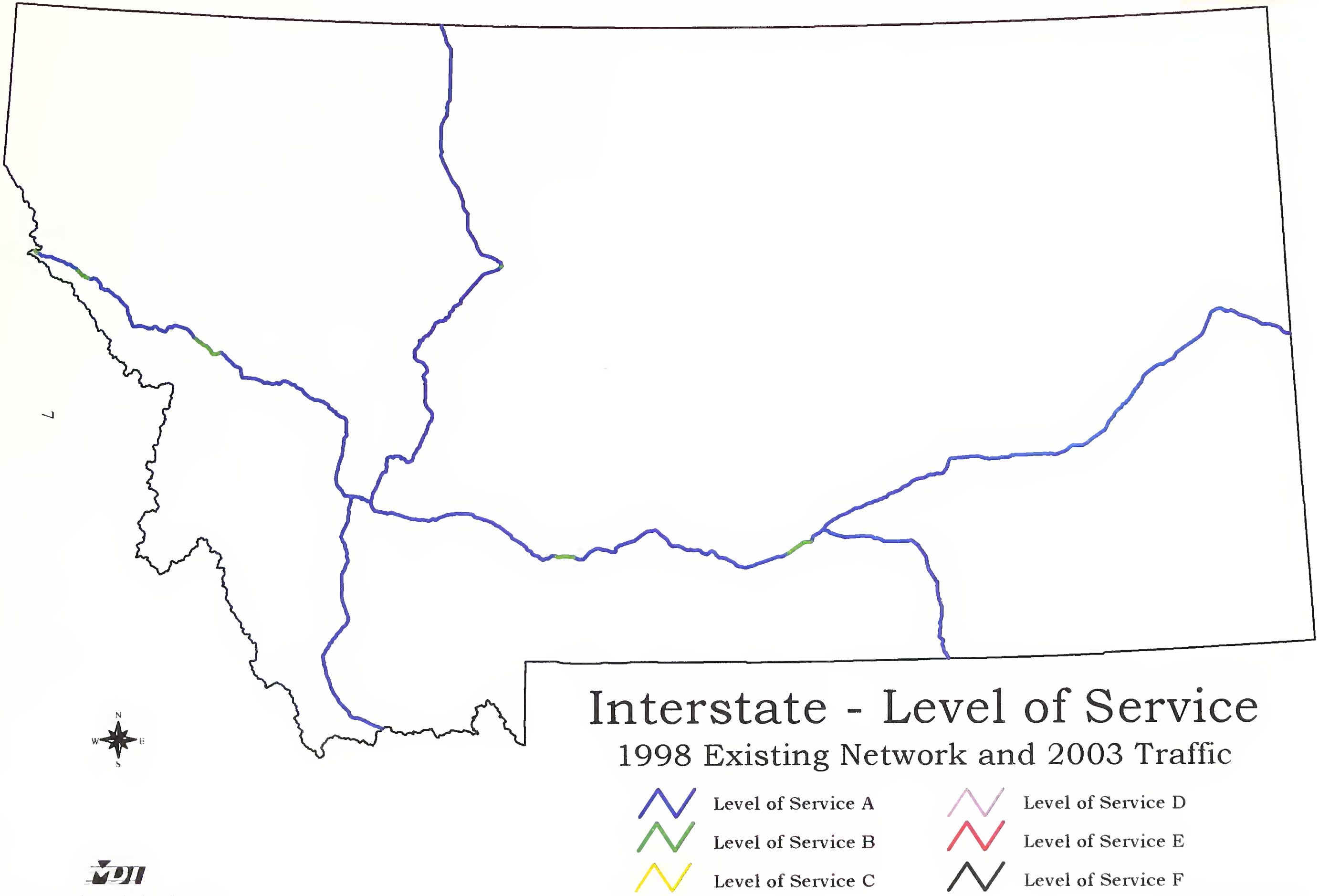


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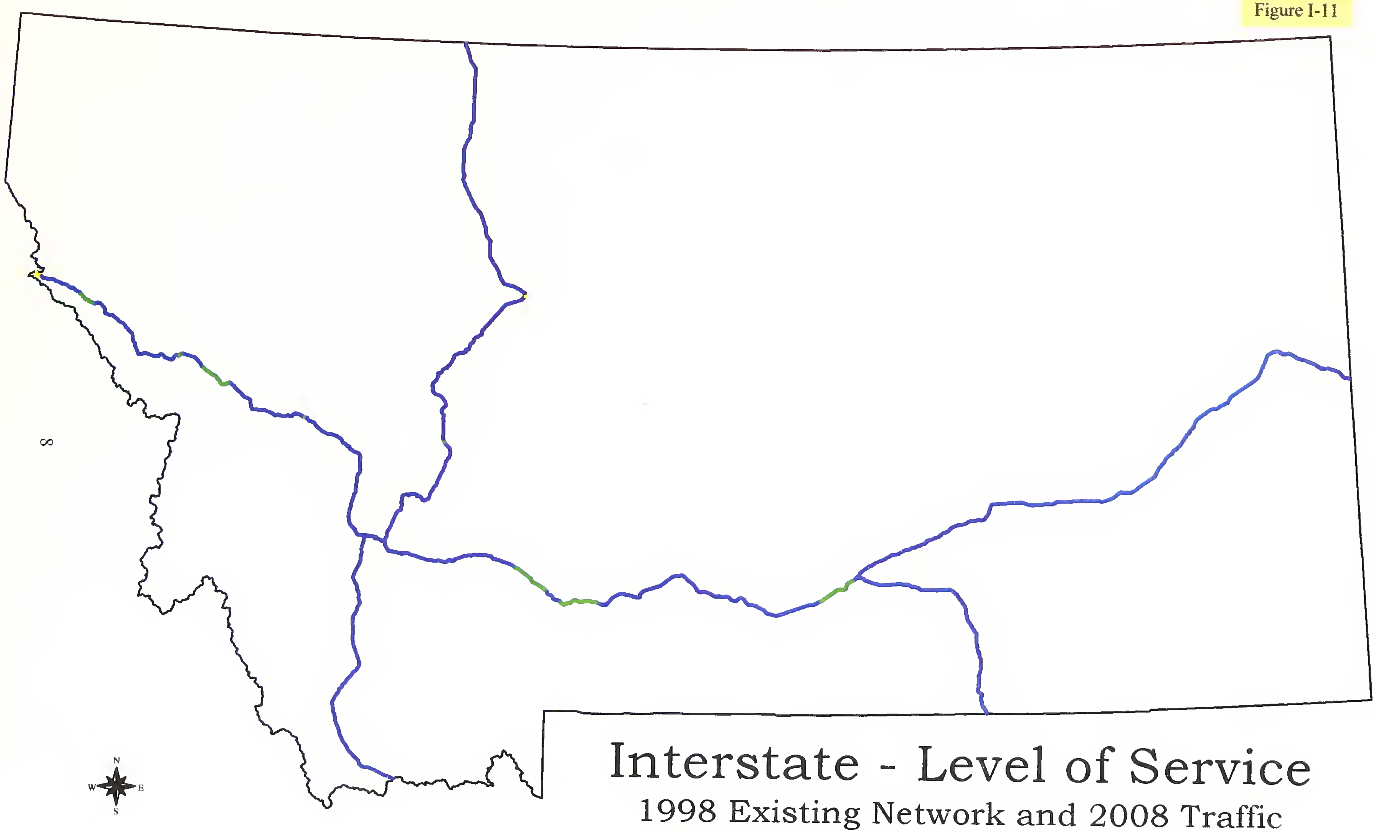
Figure I-11



Interstate - Level of Service

1998 Existing Network and 2008 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F

Data and Statistics Bureau

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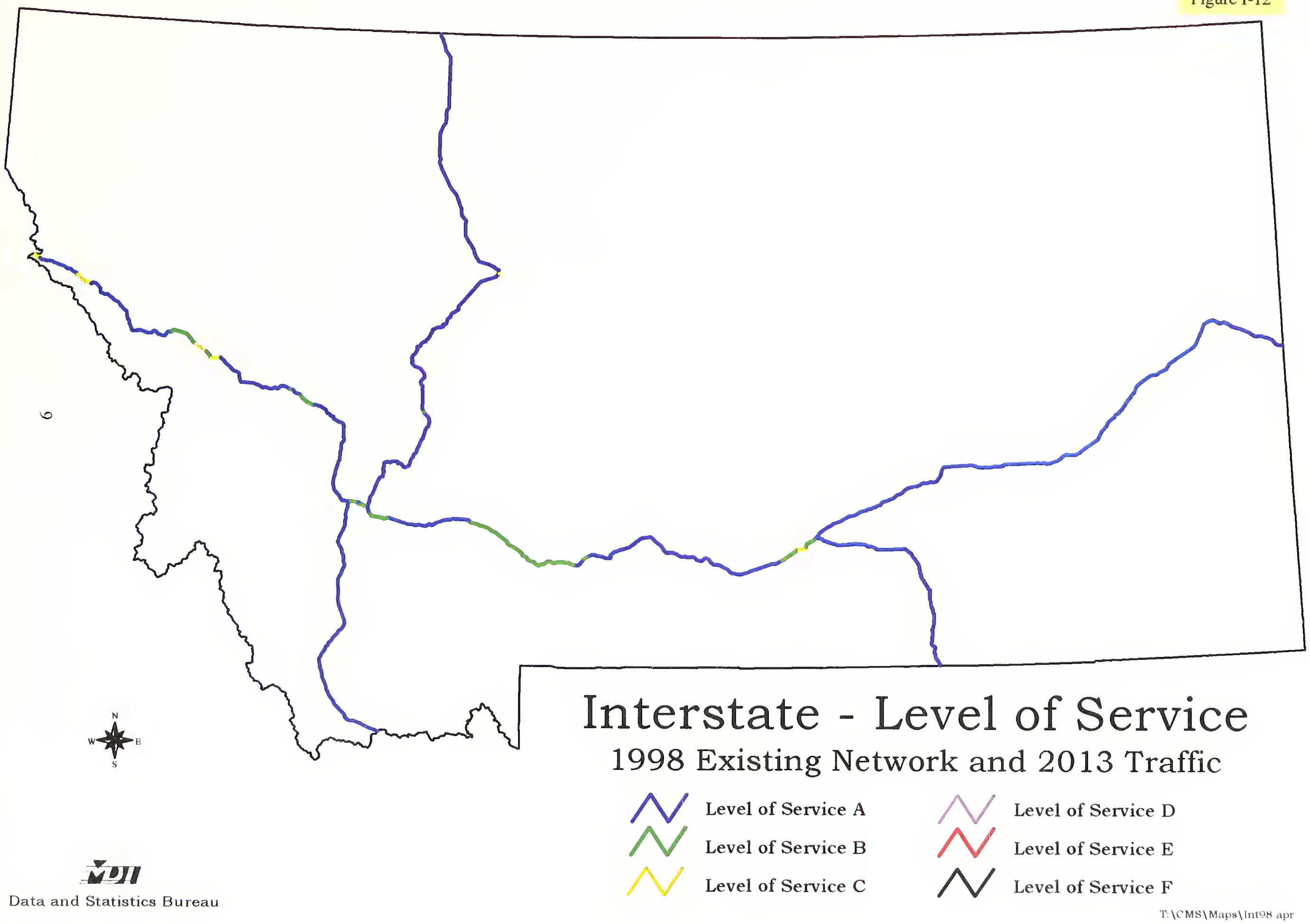
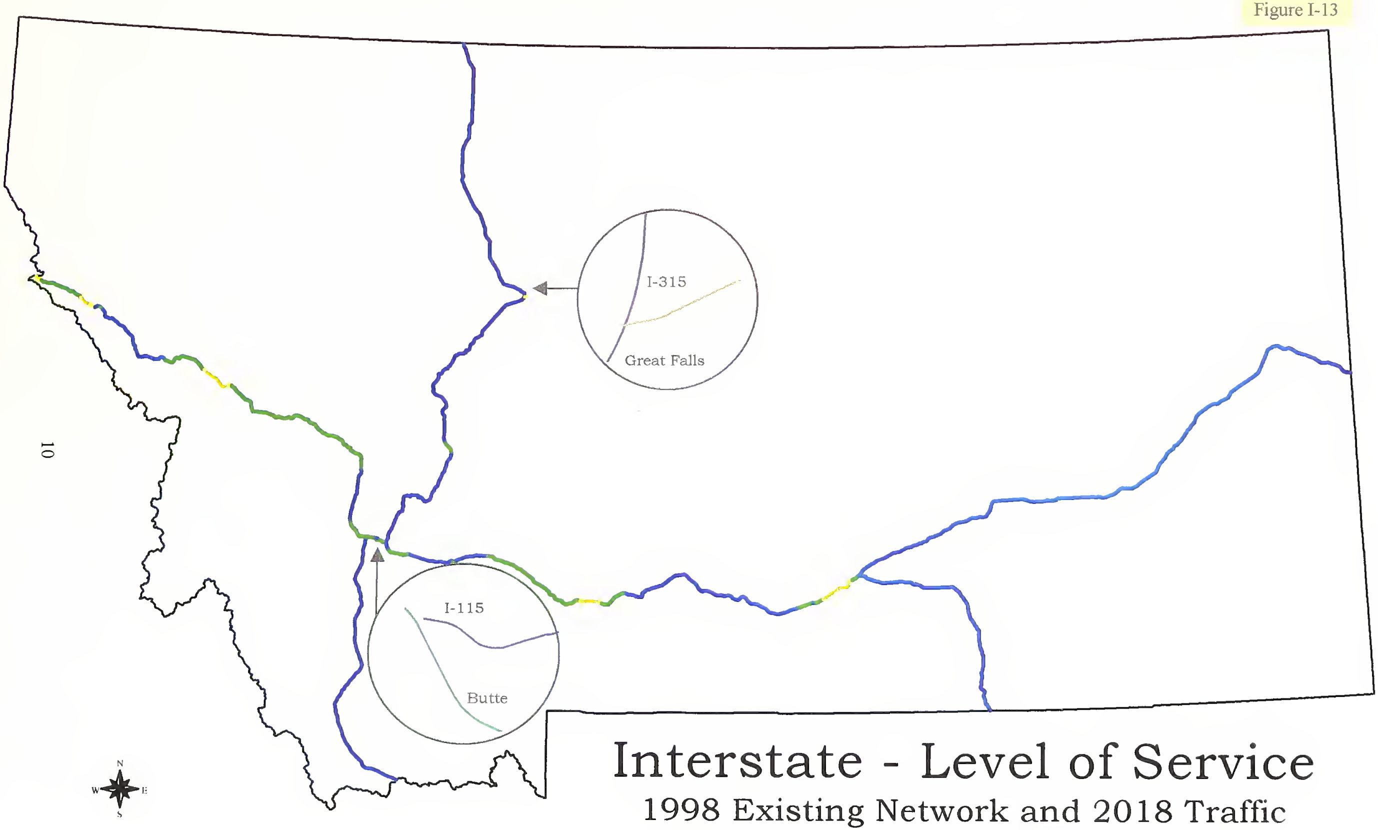
Figure I-12



Interstate - Level of Service

1998 Existing Network and 2013 Traffic

Figure I-13



Interstate - Level of Service

1998 Existing Network and 2018 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F

Data and Statistics Bureau

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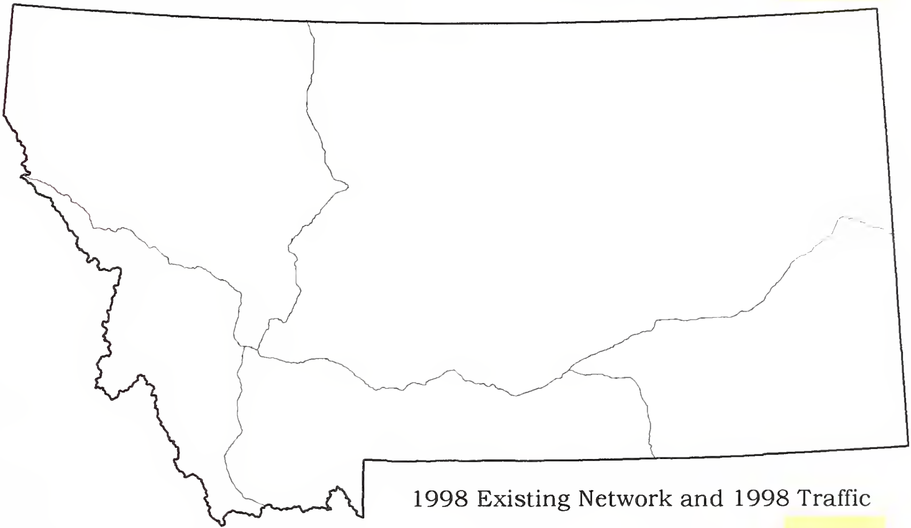
Interstate
Level of Service "Hot Spots"

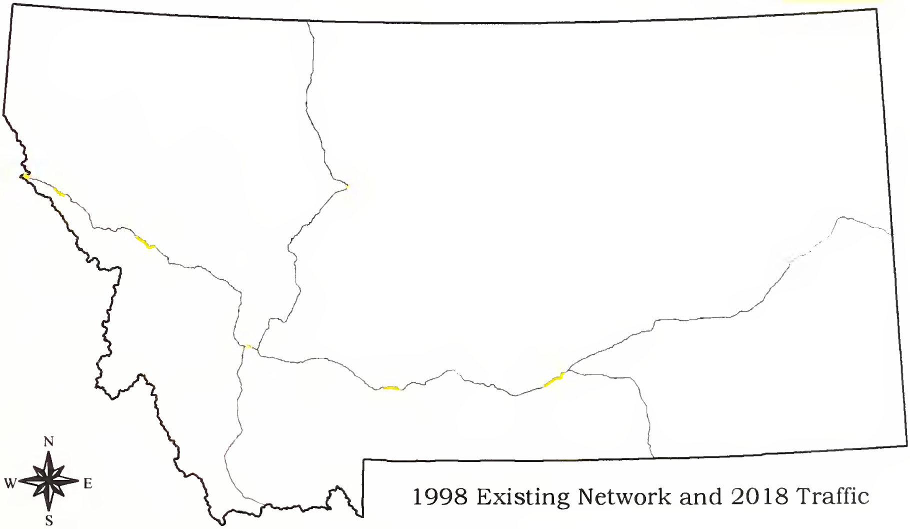
(Congestion Index < 70 - LOS of C or lower)

Figure I-14



1998 Existing Network and 1998 Traffic

Figure I-15



1998 Existing Network and 2018 Traffic

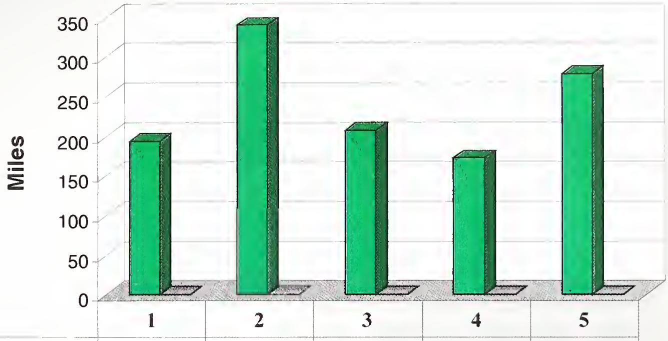
Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F
Interstate

Interstate System

1998 District Comparison "Hotspots"

Congestion Index < 70 (LOS C or lower)

Figure I-16



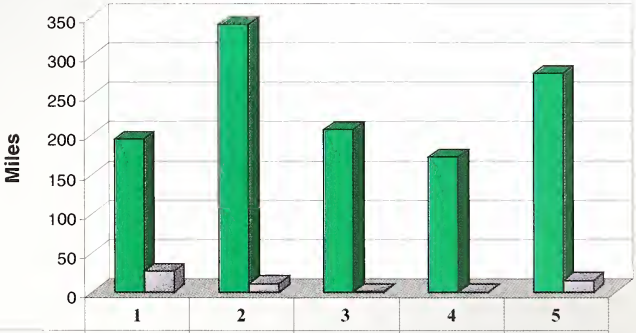
	1	2	3	4	5
🟩 Total Interstate Miles	194	340	207	172	278
▨ Miles of CI< 70	0	0	0	0	0

Interstate System

2018 District Comparison "Hotspots"

Congestion Index < 70 (LOS C or lower)

Figure I-17



	1	2	3	4	5
🟩 Total Interstate Miles	194	340	207	172	278
▨ Miles of CI< 70	26	11	1	0	15

3

Notes

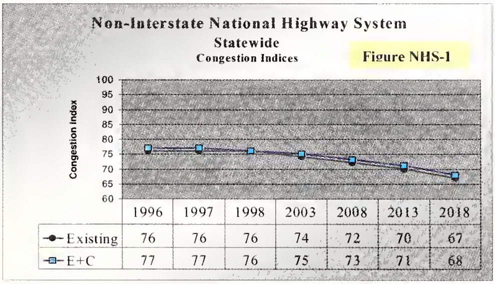
Rural Non-Interstate National Highway System

General Information

The following analysis reflects only the rural portions of the NI-NHS. Those segments of the NI-NHS that pass through the 14 urban areas as well as Columbia Falls, Whitefish, and Glendive will be included in the Urban Corridors section of the CMS report.

Existing Network

As illustrated in **Figure NHS-1**, the overall, statewide existing network CI is currently 76 (LOS B) and, as expected, will not fall below a CI of 67 (LOS C) within the next 20 years. The CI remained constant throughout 1996, 1997, and 1998.



	1996	1997	1998	2003	2008	2013	2018
● Existing	76	76	76	74	72	70	67
■ E+C	77	77	76	75	73	71	68

E+C Network

The E+C Network consists of the existing highway infrastructure plus any capacity enhancing projects in the most current STIP. The following projects are from the 1998-2000 STIP. This list includes *only* those with potential capacity enhancing features:

	Project Name	Route	Length
1	Pleasant Valley	P-1	8.078
2	Lothair-E	P-1	13.235
3	Havre-West	P-1	.855
4	Vaughn-Sun River	P-3	7.625
5	Warren-N&S	P-4	.516
6	Post Cr Hill Climbing	P-5	.400
7	Somers-Ashley Creek	P-5	5.6
8	Ashley Creek – Kalispell	P-5	2.9
9	Florence-North	P-7	2.1
10	Lolo-South	P-7	5.654
11	Sula-N&S	P-7	8
12	Townsend-Urban	P-8	1.4
13	US 287 Passing Lanes	P-8	8.2
14	Plentywood-W.	P-22	11.2
15	Coalwood-South	P-23	8.016
16	Olive-N&S	P-23	12.2
17	Plentywood-North	P-34	9.866
18	Raymond-North	P-34	5.406
19	Lame Deer-E.	P-37	7.08
20	1 km E. of Lame Deer-E.	P-37	4.97
21	Camp Pass-East	P-37	7.8
22	Geyser-Stanford	P-57	12.73
23	Brockway-East	P-57	6.2
24	Circle-SW	P-57	5.7
25	19 km N of Roundup-N.	P-61	8.755
26	Bohemian Corner-S	P-61	11.9
27	Sidney-Northwest	P-62	1.474
28	NW of Sidney-NW	P-62	8.3
29	Sioux Pass-North	P-62	5.9

Individual NI-NHS Routes

Figure NHS-2 (see page 14) illustrates the Existing and E+C Network CIs by individual routes.

District Comparisons

Figures NHS–3 through **NHS-8** (see page 15) compare the overall NI-NHS CIs in each of the Districts.

Figures NHS-9 through **NHS-13** (see pages 16-20) are maps which illustrate CIs on the existing highway network for the entire NI-NHS system for the years 1998 through 2018 in five-year increments.

Hot Spots

Figures NHS-14 and **NHS-15** (see page 21) have been developed to better illustrate segments of the Non-Interstate NHS that currently have, or are projected to have, service levels of less than C. Only the 1998 and 2018 maps for the Existing Highway network are shown in this report. Interim year maps for the Existing and E+C networks are available from the Data and Statistics Bureau.

Figures NHS-16 and **NHS-17** (see page 22) compare the total number of miles of NI-NHS in each District against the numbers of miles of NI-NHS operating below a CI of 55 (less than LOS C).

Non-Interstate National Highway System

October 1999

Figure NHS-2

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
P1	78	78	76	78	76	77	75	75	73	73	71	71
P3	58	62	62	94	58	93	**54**	92	**50**	92	**47**	91
P4	75	75	70	76	75	75	79	74	72	72	71	71
P5	**58**	**52**	**53**	85	**49**	**51**	**40**	**47**	**40**	**31**	**34**	**38**
P7	67	66	61	67	58	64	55	62	**51**	59	**48**	56
P8	70	72	70	73	66	69	61	65	57	81	**53**	57
P10	58	81	86	▒	86	▒	79	▒	76	▒	76	▒
P11	58	81	75	▒	71	▒	67	▒	83	▒	58	▒
P12	**58**	**50**	**36**	▒	**44**	▒	**40**	▒	**34**	▒	**27**	▒
P14	81	81	70	73	79	79	79	74	76	76	75	75
P16	73	71	73	▒	70	▒	67	▒	83	▒	61	▒
P20	77	72	70	▒	70	▒	77	▒	76	▒	74	▒
P22	85	85	85	85	85	85	84	81	83	81	83	83
P23	58	66	85	85	86	85	84	81	83	81	83	83
P24	58	66	58	▒	36	▒	84	▒	81	▒	59	▒
P34	81	83	86	67	62	86	61	65	76	81	77	82
P37	77	77	77	76	77	77	76	76	75	75	73	73
P38	**42**	**41**	**36**	▒	**37**	▒	**53**	▒	**28**	▒	**6**	▒
P50	58	55	**36**	▒	**36**	▒	**45**	▒	**40**	▒	**31**	▒
P53	81	81	86	▒	85	▒	53	▒	81	▒	79	▒
P57	85	85	85	85	86	86	82	81	81	81	80	80
P60	81	55	58	59	86	56	**53**	**53**	**51**	**51**	**49**	**49**
P61	81	83	86	94	62	83	84	81	76	81	78	78
P62	58	66	86	67	85	87	85	81	83	86	83	85
P63	78	75	70	▒	68	▒	67	▒	65	▒	63	▒
P85	63	63	60	▒	55	▒	**50**	▒	**45**	▒	**39**	▒
P88	68	69	68	▒	67	▒	67	▒	66	▒	66	▒
P92	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
P93	57	57	56	▒	**54**	▒	**51**	▒	**49**	▒	**47**	▒
P99	96	96	96	▒	96	▒	96	▒	96	▒	96	▒

Those CI's in **red** reflect congestion indices of LOS D or lower (CI <55)

Routes in **blue** represent those routes of which portions are on both the Primary system and NI-NHS.

Only the CIs for the NI-NHS segments are reflected in this table.

[1] Traffic Year

[2] Existing Highway Network

[3] Existing plus Committed Highway Network

▒ No capacity enhancing projects planned for this route

▨ NI-NHS routes located in urban areas only; no CI's were computed

🟨 Projects on route have been let. Route will continue to show as having a committed project until the route has been re-inventoried.

Rural Non-Interstate NHS

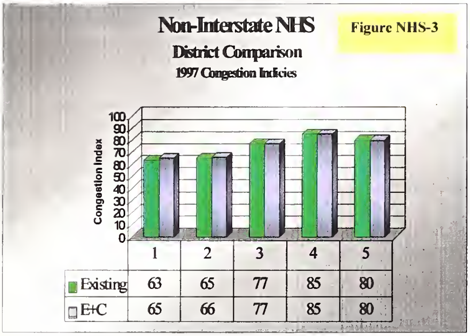


Figure NHS-3

Non-Interstate NHS
District Comparison
1997 Congestion Indicies

	1	2	3	4	5
🟩 Existing	63	65	77	85	80
☐ E+C	65	66	77	85	80

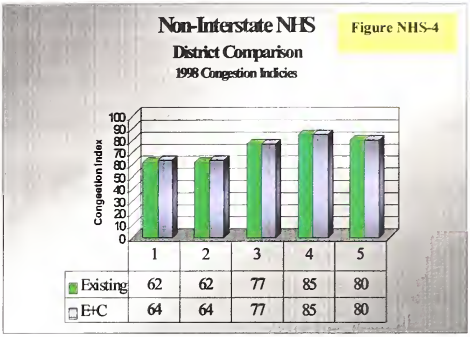


Figure NHS-4

Non-Interstate NHS
District Comparison
1998 Congestion Indicies

	1	2	3	4	5
🟩 Existing	62	62	77	85	80
☐ E+C	64	64	77	85	80

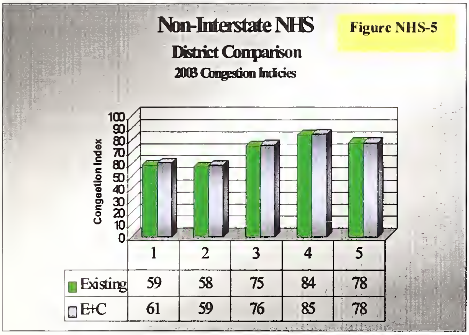


Figure NHS-5

Non-Interstate NHS
District Comparison
2003 Congestion Indicies

	1	2	3	4	5
🟩 Existing	59	58	75	84	78
☐ E+C	61	59	76	85	78

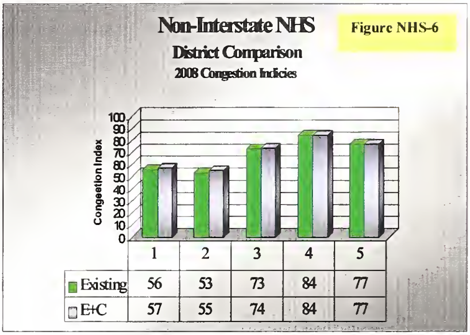


Figure NHS-6

Non-Interstate NHS
District Comparison
2008 Congestion Indicies

	1	2	3	4	5
🟩 Existing	56	53	73	84	77
☐ E+C	57	55	74	84	77

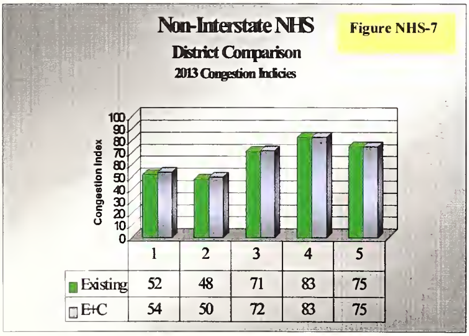


Figure NHS-7

Non-Interstate NHS
District Comparison
2013 Congestion Indicies

	1	2	3	4	5
🟩 Existing	52	48	71	83	75
☐ E+C	54	50	72	83	75

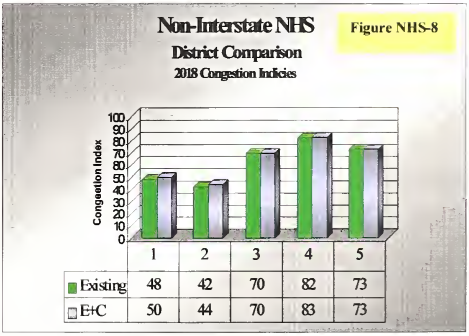
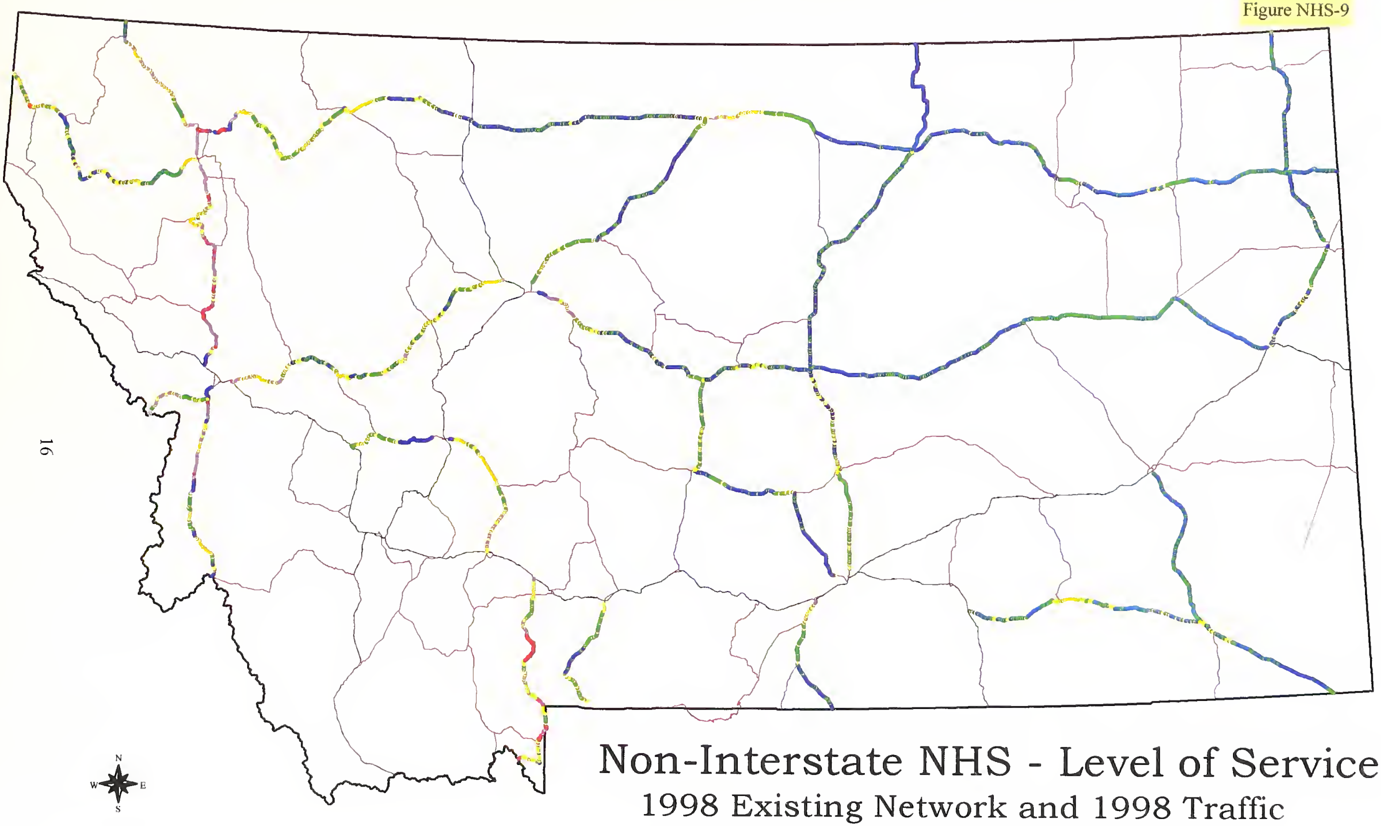


Figure NHS-8

Non-Interstate NHS
District Comparison
2018 Congestion Indicies

	1	2	3	4	5
🟩 Existing	48	42	70	82	73
☐ E+C	50	44	70	83	73

Figure NHS-9



Non-Interstate NHS - Level of Service

1998 Existing Network and 1998 Traffic

🟦 Level of Service A
🟩 Level of Service B
🟨 Level of Service C
🟪 Level of Service D
🟥 Level of Service E
⬛ Level of Service F

MDT
Data and Statistics Bureau

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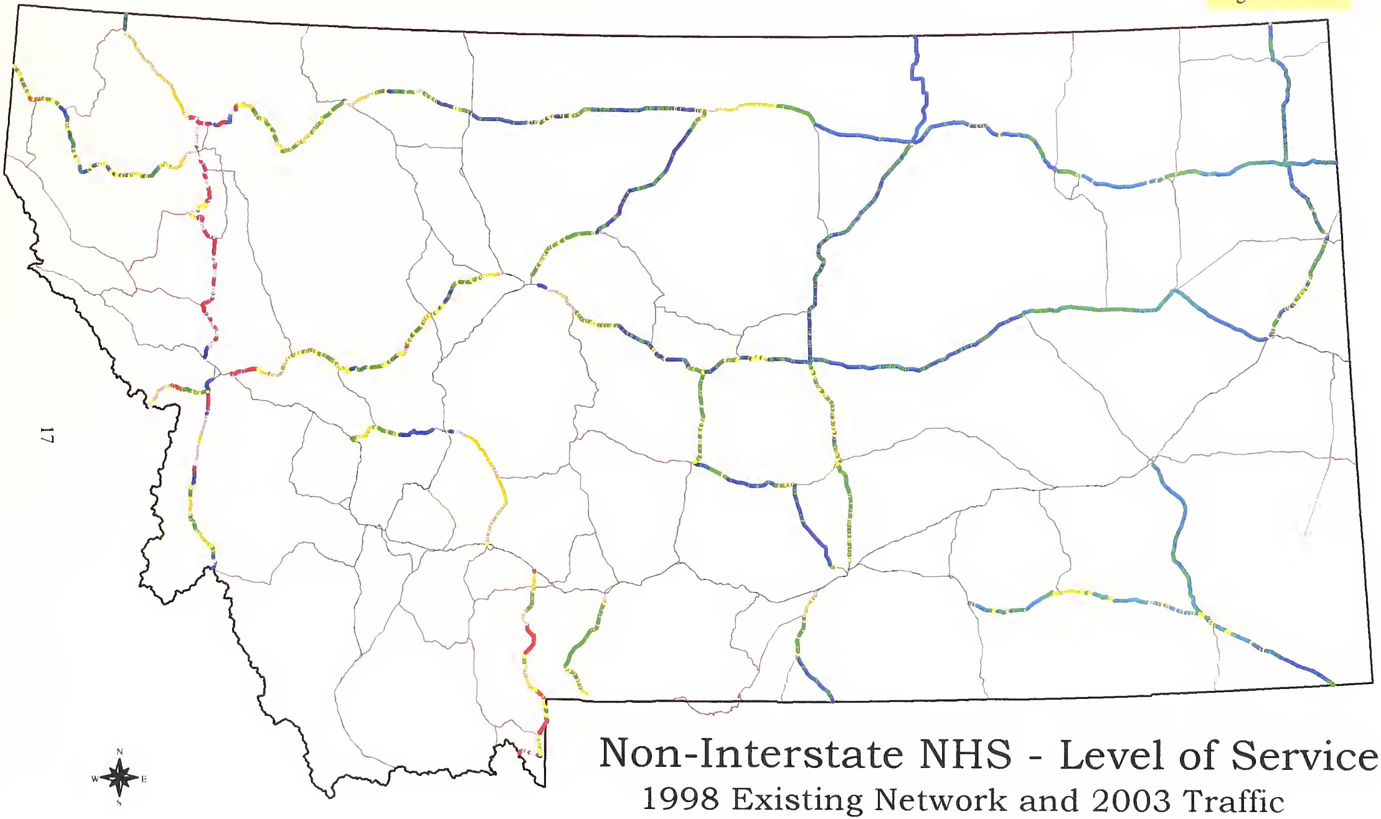
Figure NHS-10



Non-Interstate NHS - Level of Service

1998 Existing Network and 2003 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

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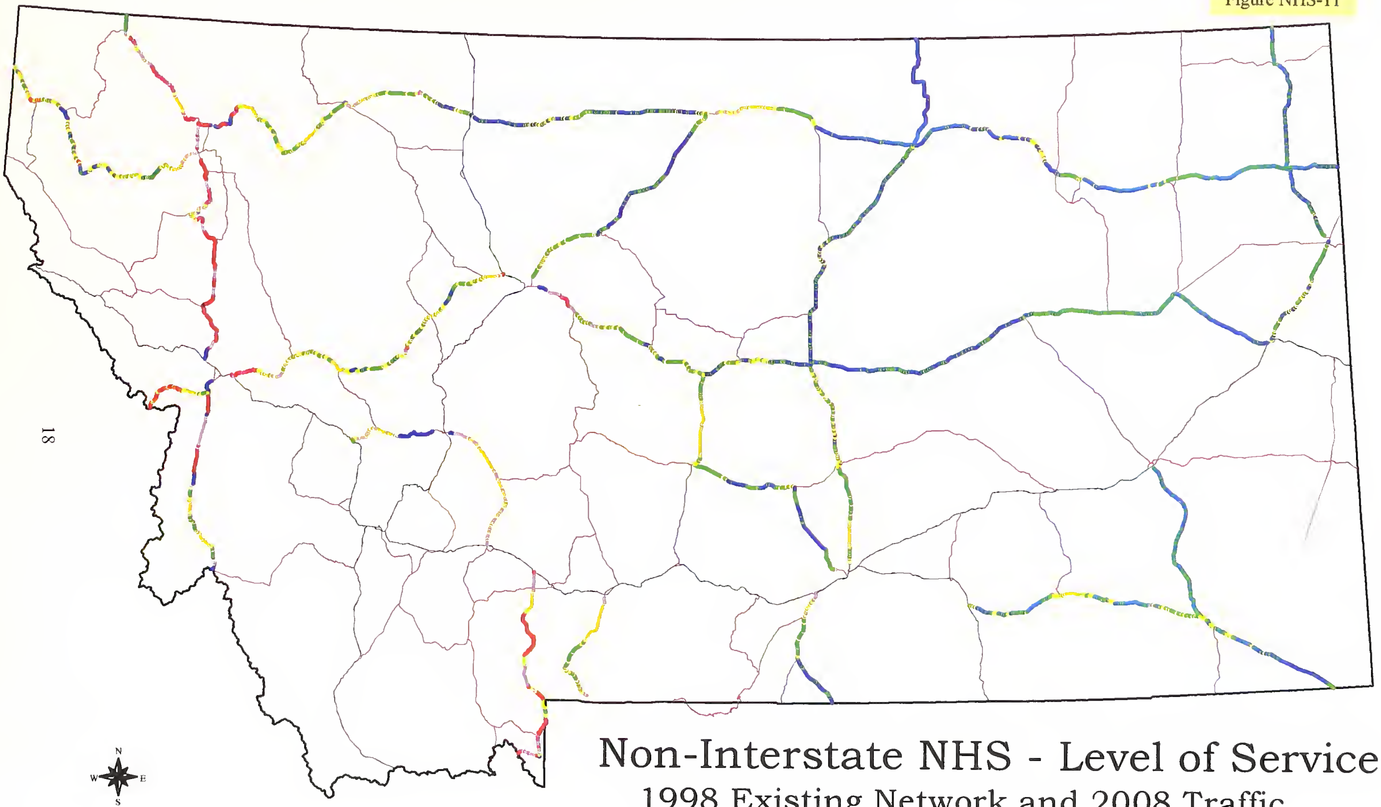
Figure NHS-11



Non-Interstate NHS - Level of Service

1998 Existing Network and 2008 Traffic

Level of Service A

Level of Service B

Level of Service C

Level of Service D

Level of Service E

Level of Service F

Data and Statistics Bureau

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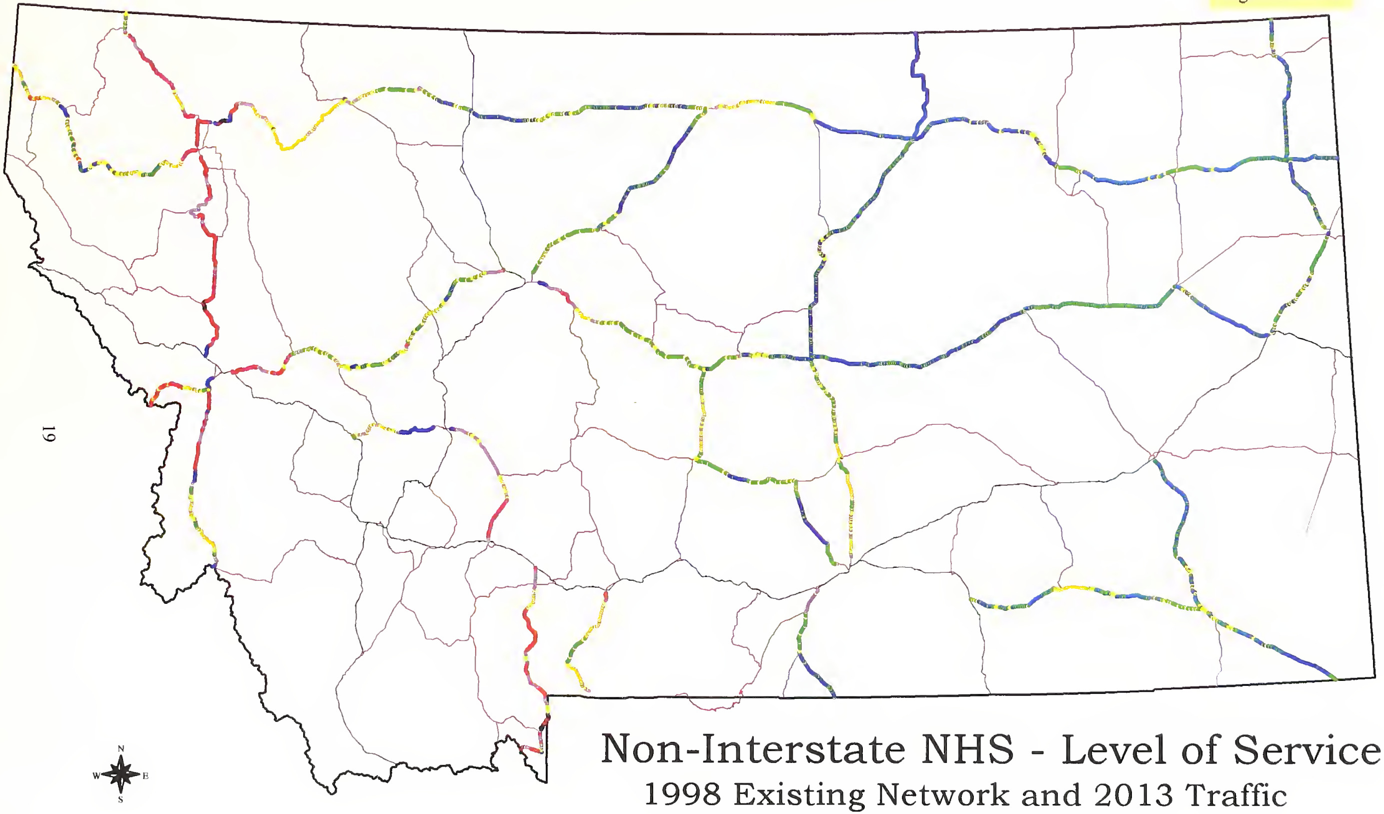
Figure NHS-12



Non-Interstate NHS - Level of Service

1998 Existing Network and 2013 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

Data and Statistics Bureau

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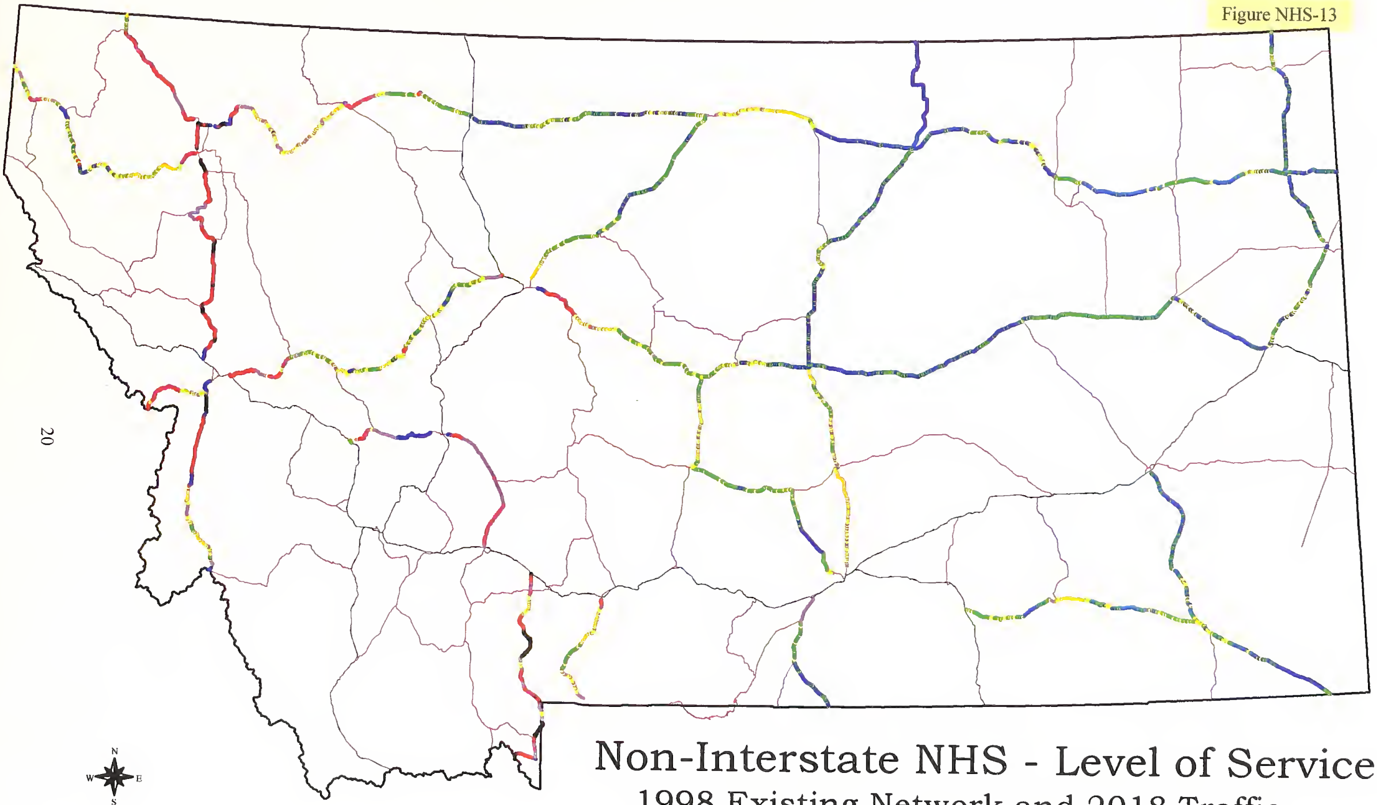
Figure NHS-13



Non-Interstate NHS - Level of Service
1998 Existing Network and 2018 Traffic

Level of Service A

Level of Service B

Level of Service C

Level of Service D

Level of Service E

Level of Service F

Data and Statistics Bureau

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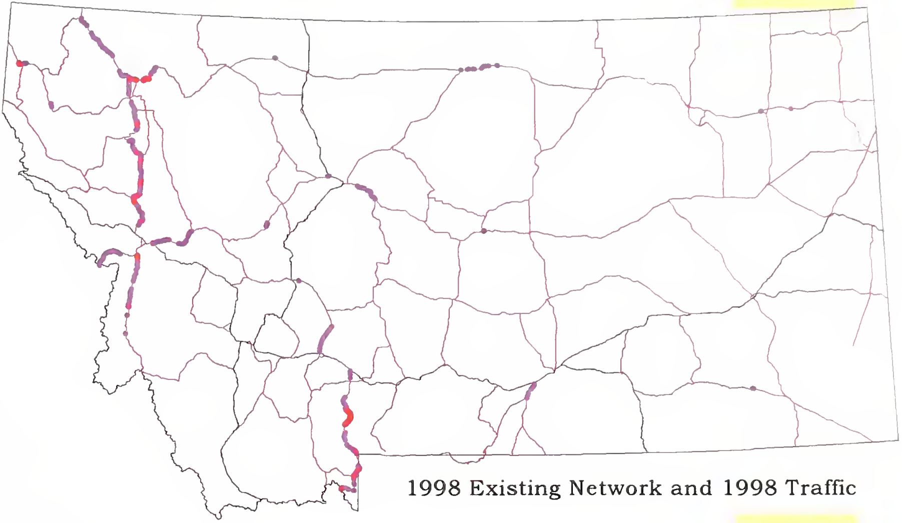
Non-Interstate NHS Level of Service "Hot Spots"

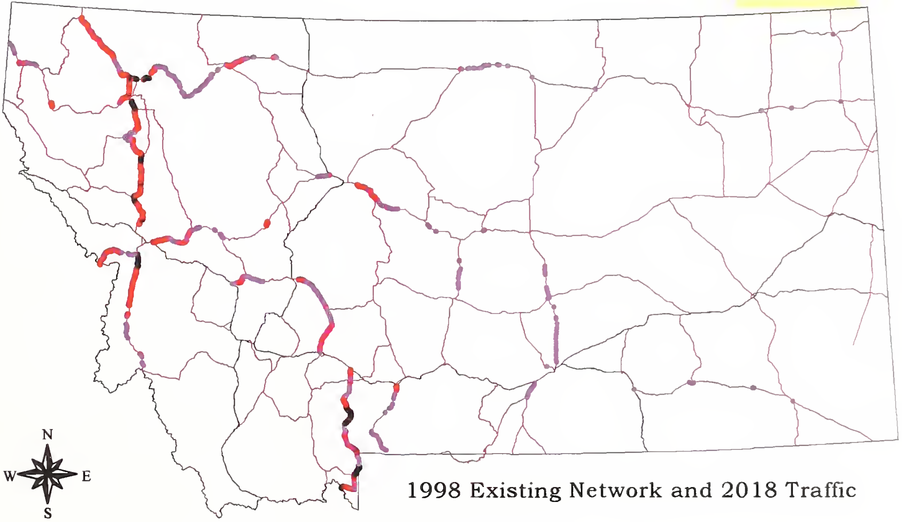
(Congestion Index < 55 - LOS of D or lower)

Figure NHS-14



1998 Existing Network and 1998 Traffic

Figure NHS-15



1998 Existing Network and 2018 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F
Interstate
NI-NHS & Primary

Data and Statistics Bureau

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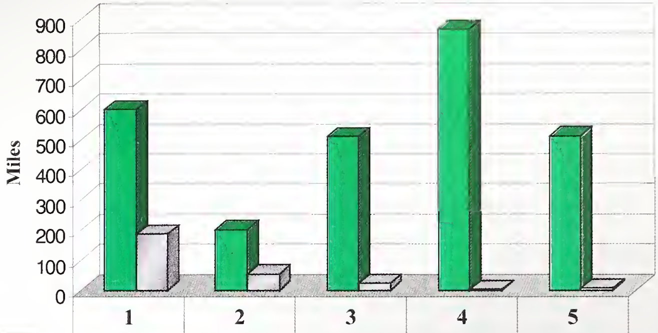
Non-Interstate NHS

1998 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)

Figure NHS-16



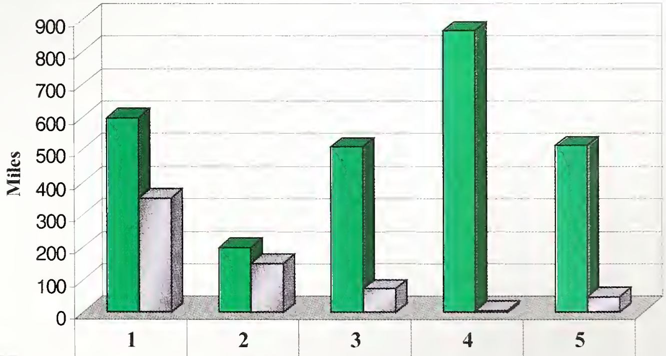
	1	2	3	4	5
🟩 Total NI-NHS Miles	598	200	509	865	512
☐ Miles of CI < 55	186	54	24	2	6

Non-Interstate NHS

2018 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)

Figure NHS-17



	1	2	3	4	5
🟩 Total NI-NHS Miles	598	200	509	865	512
☐ Miles of CI < 55	352	151	72	7	49

4

Notes

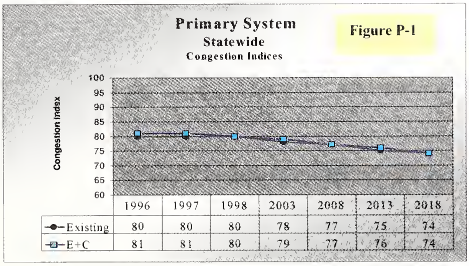
Rural Primary System

General Information

The following analysis reflects only the rural portions of the Primary System. Those segments of the Primary that pass through the 14 urban areas as well as Columbia Falls, Whitefish, and Glendive will be included in the Urban Corridor section of the CMS report.

Existing Network

As illustrated in **Figure P-1**, the overall, statewide existing network CI is currently 80 (LOS B) and, as expected, will not fall below a CI of 74 (LOS B) within the next 20 years. The CI remained constant throughout 1996, 1997 and 1998.



E+C Network

The E+C Network consists of the existing highway infrastructure plus any capacity enhancing projects in the most current STIP. The following projects are from the 1998-2000 STIP. This list includes ***only*** those with potential capacity enhancing features:

	Project Name	Route	Length
1	Plevna-E&W	P-2	12.6
2	Miles City-E.	P-2	7
3	Dupuyer-North	P-3	8.65
4	Paradise-E (East Section)	P-6	5
5	Dixon-West	P-6	10.18
6	Weeksville-W	P-6	6.7
7	Cameron-N&S	P-13	11.2
8	Sappington Jct-South	P-13	.7
9	19 km E. of Roundup-E	P-14	7
10	Roundup-East	P-14	12.1
11	Musselshell-E&W	P-14	6.52
12	Maxville-Drummond	P-19	14.272
13	Flaxville-E & W	P-22	7.200
14	Twin Bridges-N	P-29	6.2
15	Silver Star-N&S	P-29	7
16	Twin Bridges - Sheridan	P-29	8.7
17	Sidney-West	P-51	11.8
18	Ringling-N.	P-59	7.8
19	Absarokee-N&S	P-78	7
20	Columbus-S.	P-78	9
21	Clearwater Jct-North	P-83	13.110
22	Seeley Lake Safety-South	P-83	1.690
23	Four Corners-W.	P-84	6.9

Individual Primary Routes

Figure P-2 (see pages 24-25) illustrates the Existing and E+C network CIs by individual routes.

District Comparisons

Figures P-3 through **P-8** (see page 26) compare the overall Primary System CIs in each of the Districts.

Figures P-9 through **P-13** (see pages 27-31) are maps with illustrate CIs on the Existing Highway network for the entire Primary system for the years 1998 through 2018 in five-year increments.

Hot Spots

Figures P-14 and **P-15** (see page 32) have been developed to better illustrate segments of the Primary System that currently have or are projected to have service levels of less than C. Only the 1998 and 2018 maps for the Existing Highway networks are shown in this report. Interim year maps for the Existing and E+C networks are available from the Data and Statistics Bureau.

Figures P-16 and **P-17** (see page 33) compare the total number of miles of Primary in each district against the number of miles of Primary operating below a CI of 55 (less than LOS C).

Missing Route Data

Due to the unavailability of inventory data on P-97 (.345 miles), it could not be analyzed. It should be understood that the CI for this route was therefore not considered in the analysis either at the statewide or district (#4) level. The analysis for this route will be included as soon as inventory data becomes available.

Primary System

Individual Routes

Congestion Indices

Figure P-2

Route No.	1996[1] [2]	1997 Existing	1997 E+C[3]	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
P1	91	90	90	95	95	94	94	93	93	91	91	90	90
P2	87	87	88	86	87	86	88	86	88	84	85	85	85
P3	81	89	81	86	81	86	83	75	79	75	79	78	78
P4	64	84	64	63	63	61	61	59	59	56	56	54	54
P6	74	74	76	74	76	76	71	87	88	63	65	59	61
P7													
P8	70	84	64	86	64	84	65	82	62	59	59	54	54
P9	88	87		86		85		85		84		84	
P10													
P11	74	72		73		72		76		89		67	
P13	74	75	76	74	72	86	88	84	88	61	62	57	58
P14	83	84	85	84	85	84	88	84	88	82	83	81	82
P17	87	87		86		86		84		84		84	
P18	90	86		89		86		87		89		85	
P19	75	74	76	74	76	74	75	72	79	74	79	69	71
P20	81	82		61		86		75		77		76	
P21	77	76		75		75		75		77		77	
P22	85	84		86	87	85	88	84	88	84	86	84	85
P23													
P25	88	89		89		89		89		89		88	
P26	89	90		86		86		86		86		87	
P27	85	84		85		85		84		84		83	
P28	69	89		66		84		82		59		57	
P29	70	74	76	74	73	84	72	86	79	86	88	64	67
P30	85	84		84		84		84		82		82	
P31	92	82		61		61		61		91		90	
P32	90	86		89		86		89		86		88	
P33	87	64		89		61		58		89		51	
P35	75	76		75		73		76		66		63	
P36	81	76		76		76		75		74		71	
P39	83	84		82		61		89		86		79	
P41	81	84		76		75		76		74		72	
P42	90	61		86		89		86		86		88	
P43	87	87		87		87		87		86		86	
P44	64	85	85	84	84	83	83	83	83	82	62	82	82
P45	88	89	88	89	88	86	88	87	87	87	87	86	86
P46	85	89		86		87		84		89		83	
P47	88	86		84		85		84		84		83	
P48	64	87		87		86		86		84		84	
P49	70	73		72		76		84		89		66	
P50	90	91		82		91		91		89		88	
P51	90	82		82		91		91		91		90	
P52	50	51		44		41		38		34		29	
P54	90	89		89		89		89		88		88	
P55	77	78		74		71		69		66		63	

Primary System

Individual Routes

Congestion Indices

Route No.	1996[1] [2]	1997 Existing	1997 E+C[3]	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
P56	75	70	77	74	74	74	73	71	71	70	70	68	68
P57	84	84		87		87		86		65		84	
P58	67	87		69		87		65		62		60	
P59	84	88	89	88	89	88	88	87	87	88	88	85	85
P60	82	63		63		82		82		61		80	
P65	50	50		63		50		88		42		38	
P66	85	88		65		88		88		63		82	
P67	72	72		74		73		72		72		71	
P68	80	60		79		70		77		70		74	
P69	81	61		79		77		70		73		70	
P72	79	70		70		70		74		71		68	
P75	73	74		75		72		70		60		62	
P78	69	70	72	88	70	88	67	60	63	56	59	52	55
P80	89	88		88		88		88		87		87	
P81	80	88		88		60		87		87		87	
P82	51	63		63		48		44		40		35	
P83	59	60		57		88		50		48		40	
P84	71	72	73	70	72	60	69	65	66	61	62	57	58
P86	72	74		71		88		87		65		63	
P87	71	72		71		60		88		59		54	
P89	85	63		60		65		63		82		60	
P91	65	65		63		62		61		60		58	
P92													
P95	78	79		74		74		73		72		71	
P96	76	75		75		74		73		72		72	
P97													
P98	92	93		93		93		93		92		92	

CI's in red reflect congestion indices of LOS D or lower (CI <55)

Routes in blue represent those routes of which portions are on both the Primary system and NI-NHS.

Only the CIs for the Primary segments are reflected in this table.

[1] Traffic Year

[2] Existing Highway Network

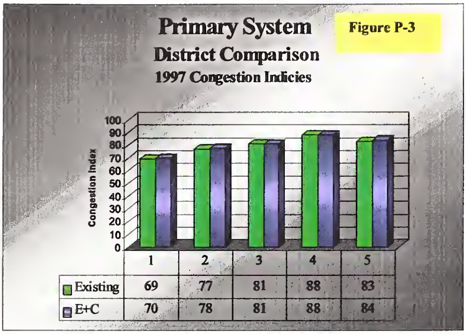
[3] Existing plus Committed Highway Network

▨ No capacity enhancing projects planned for this route

☐ Primary routes located in urban areas; no CI's were computed

☐ No general inventory data available; no CI's were computed

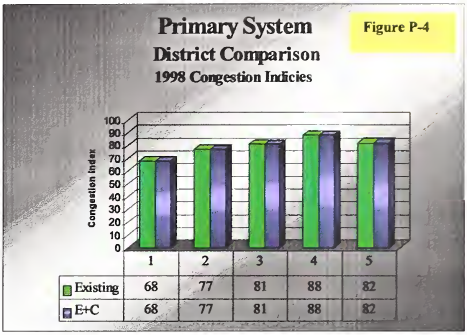
Rural Primary



Primary System
District Comparison
1997 Congestion Indicies

Figure P-3

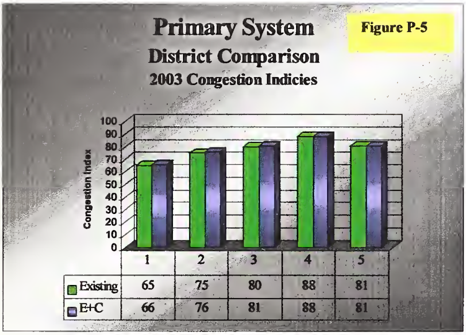
	1	2	3	4	5
🟩 Existing	69	77	81	88	83
🟪 E+C	70	78	81	88	84



Primary System
District Comparison
1998 Congestion Indicies

Figure P-4

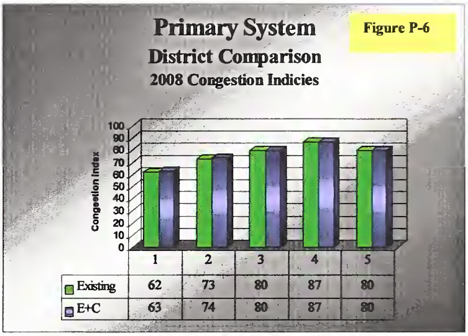
	1	2	3	4	5
🟩 Existing	68	77	81	88	82
🟪 E+C	68	77	81	88	82



Primary System
District Comparison
2003 Congestion Indicies

Figure P-5

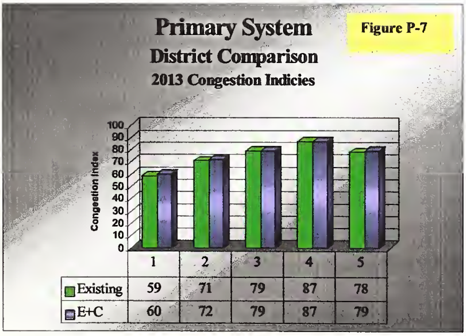
	1	2	3	4	5
🟩 Existing	65	75	80	88	81
🟪 E+C	66	76	81	88	81



Primary System
District Comparison
2008 Congestion Indicies

Figure P-6

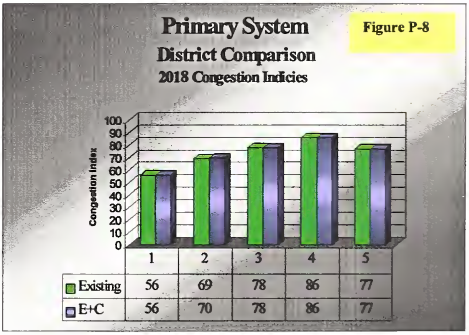
	1	2	3	4	5
🟩 Existing	62	73	80	87	80
🟪 E+C	63	74	80	87	80



Primary System
District Comparison
2013 Congestion Indicies

Figure P-7

	1	2	3	4	5
🟩 Existing	59	71	79	87	78
🟪 E+C	60	72	79	87	79

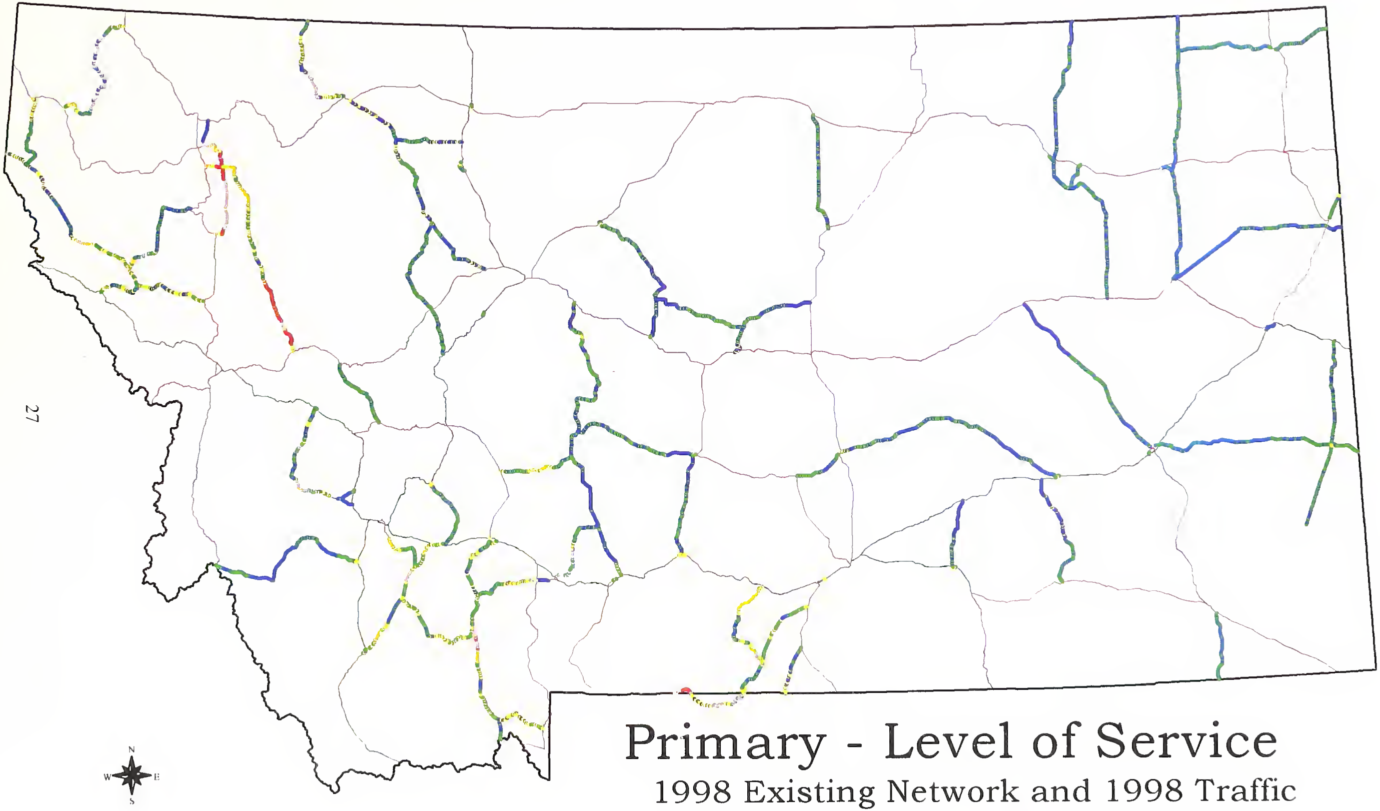


Primary System
District Comparison
2018 Congestion Indicies

Figure P-8

	1	2	3	4	5
🟩 Existing	56	69	78	86	77
🟪 E+C	56	70	78	86	77

Figure P-9



Primary - Level of Service

1998 Existing Network and 1998 Traffic

🟦	Level of Service A	◻	Level of Service D
🟩	Level of Service B	🟥	Level of Service E
🟨	Level of Service C	⬛	Level of Service F

Data and Statistics Bureau

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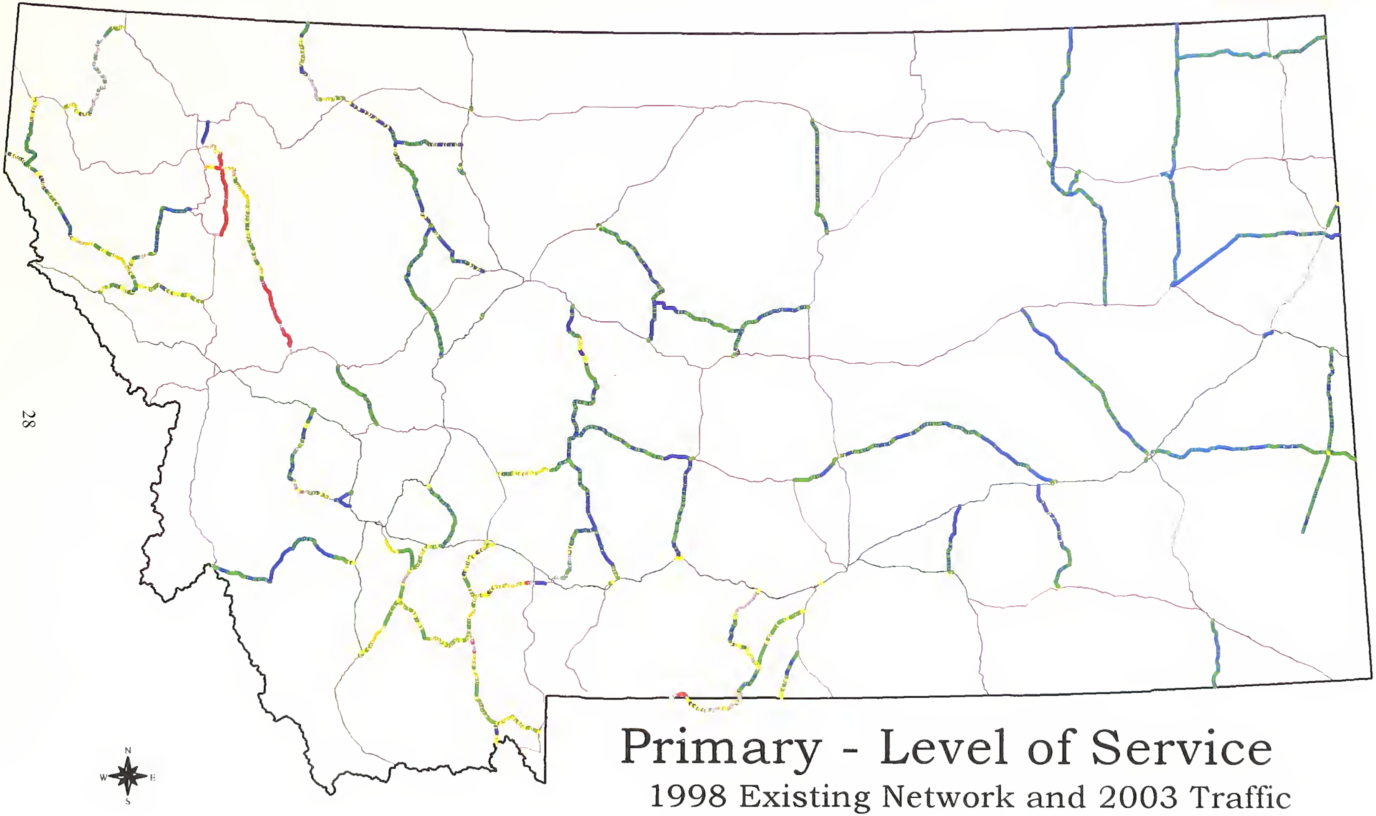
Figure P-10



Primary - Level of Service

1998 Existing Network and 2003 Traffic

- 🟦 Level of Service A
- 🟩 Level of Service B
- 🟨 Level of Service C
- Level of Service D
- 🟥 Level of Service E
- ⬛ Level of Service F

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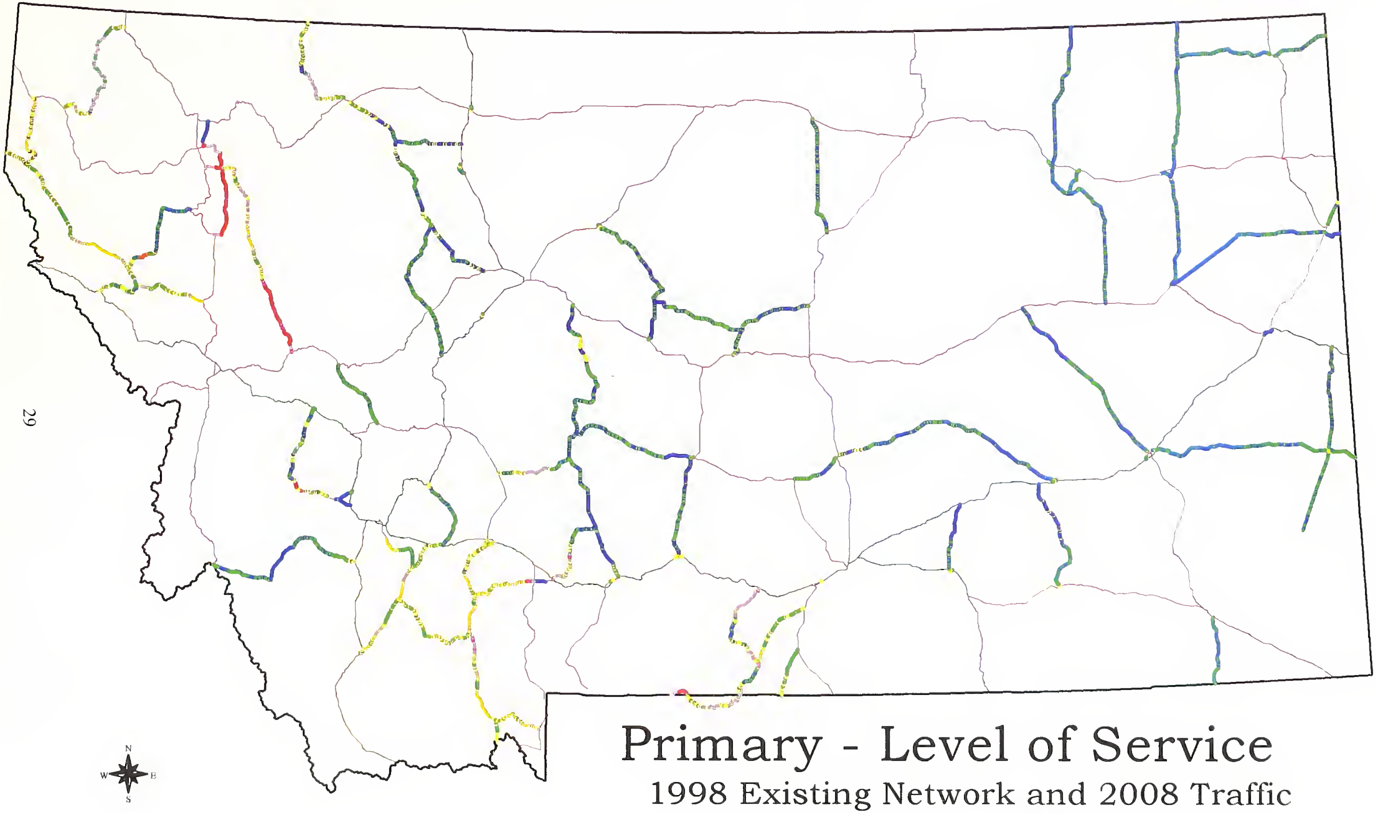
Data and Statistics Bureau

Figure P-11



Primary - Level of Service

1998 Existing Network and 2008 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F

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Data and Statistics Bureau

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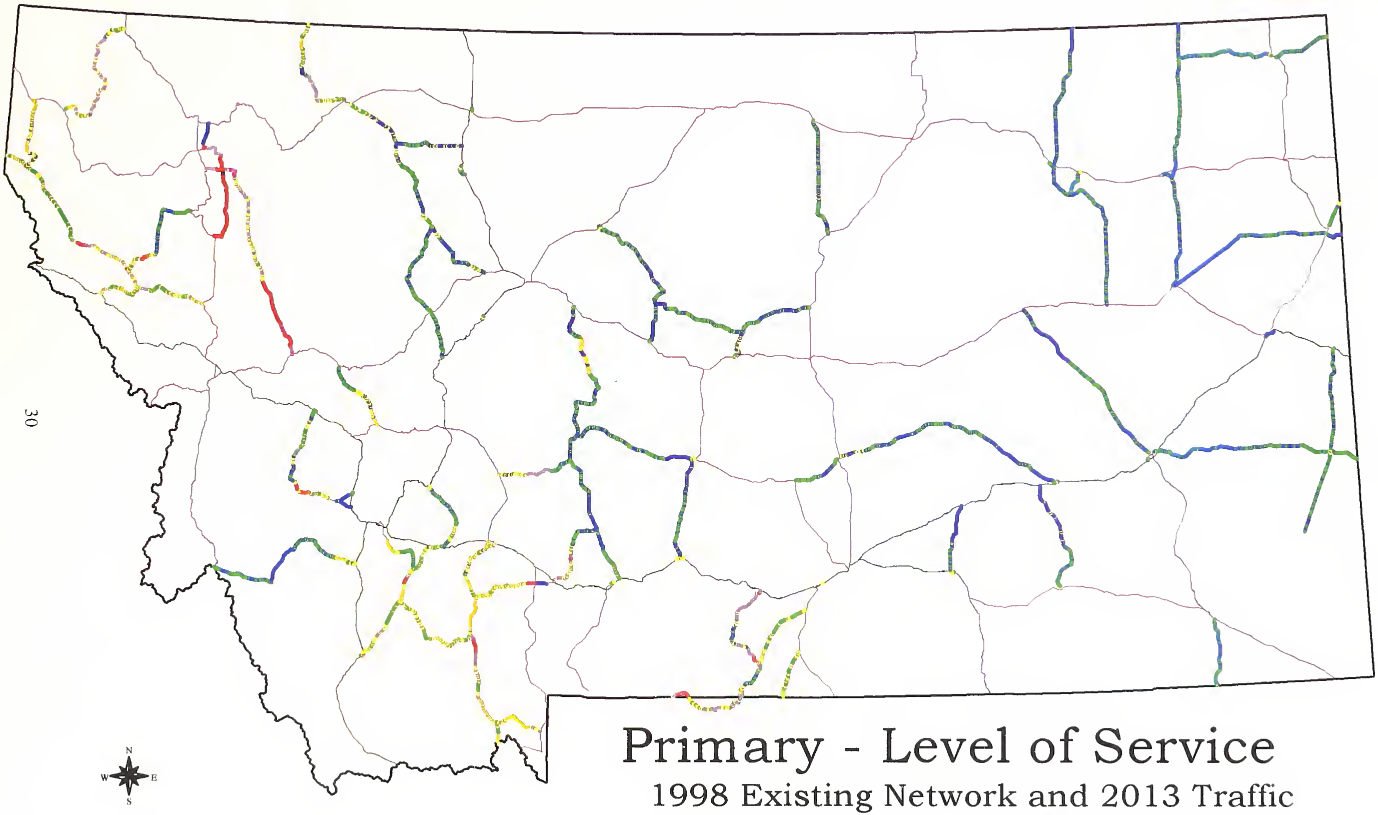
Figure P-12



Primary - Level of Service

1998 Existing Network and 2013 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

Data and Statistics Bureau

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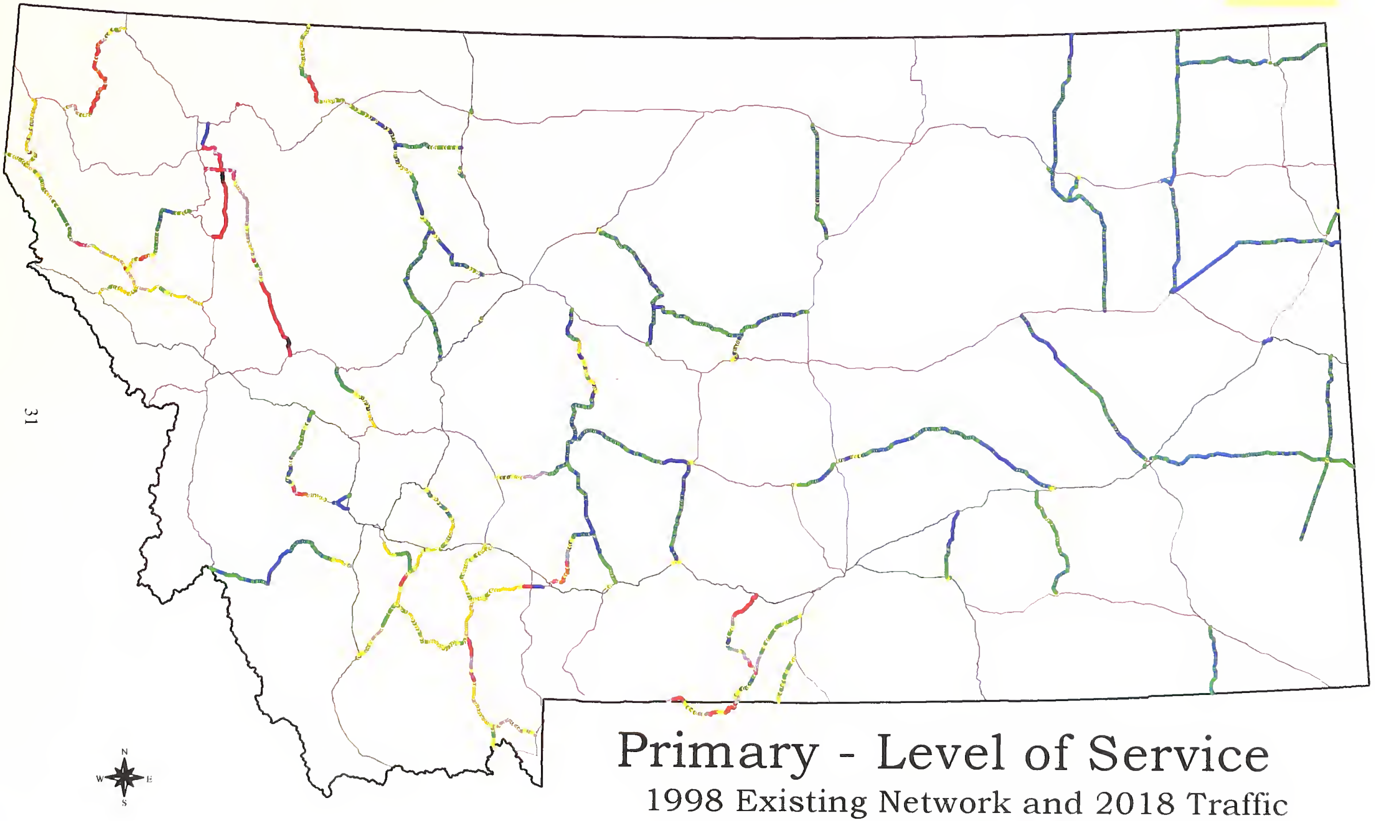
October 1999

Figure P-13



Primary - Level of Service

1998 Existing Network and 2018 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

T:\CMS\Maps\Pri2018LOS.apr

Data and Statistics Bureau

Primary
Level of Service "Hot Spots"

(Congestion Index < 55 - LOS of D or lower)

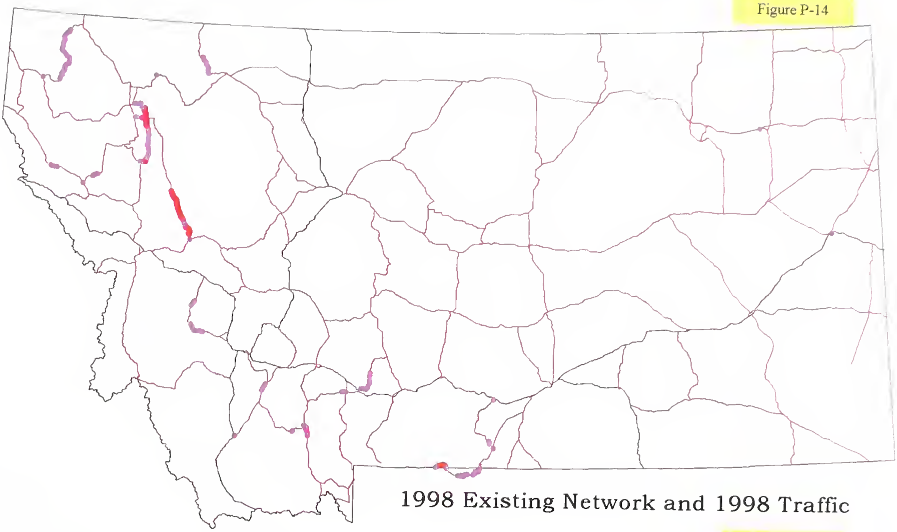


Figure P-14

1998 Existing Network and 1998 Traffic

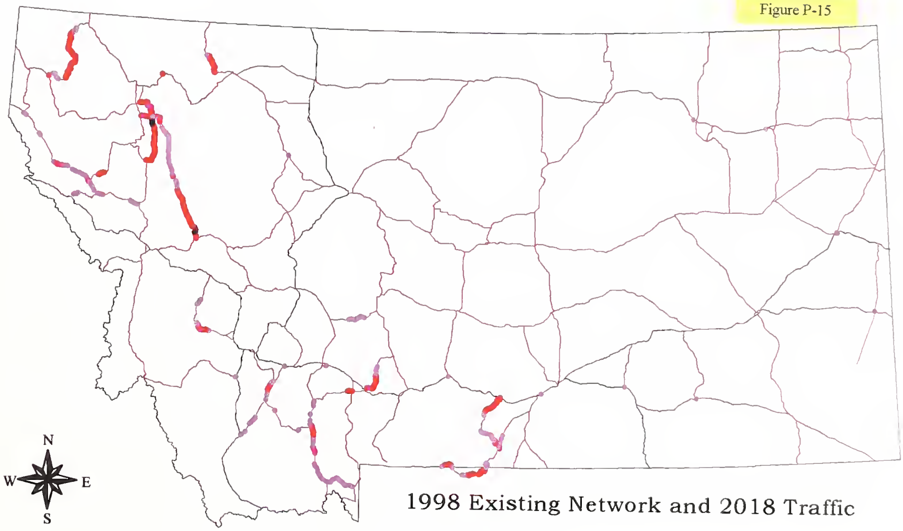


Figure P-15

1998 Existing Network and 2018 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F
Interstate
NI-NHS & Primary

Data and Statistics Bureau

Note: This map shows all "P" routes which include NINHS and Primary system routes.

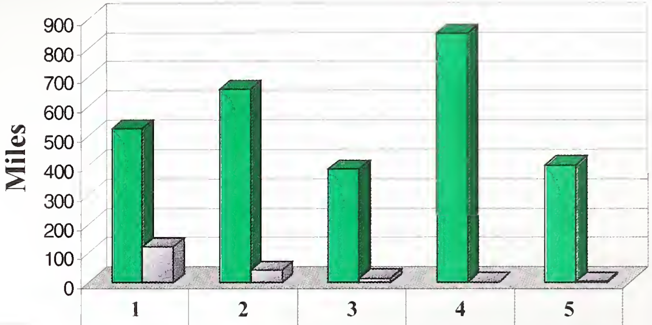
U:\CMS\MAPS\pri98hotspots.apr

Primary System

1998 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)

Figure P-16



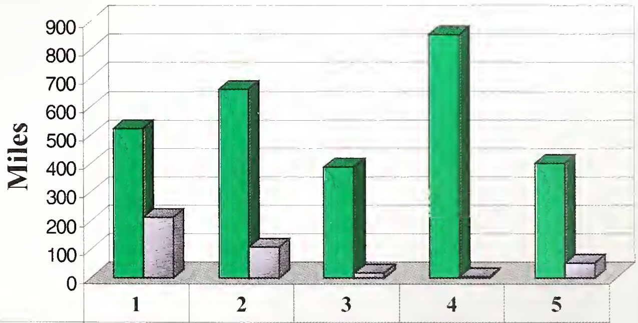
	1	2	3	4	5
🟩 Total # Primary Miles	523	658	386	848	400
▨ Miles of CI < 55	119	42	13	1	3

Primary System

2018 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)

Figure P-17



	1	2	3	4	5
🟩 Total # Primary Miles	523	658	386	848	400
▨ Miles of CI < 55	212	106	14	2	52

5

Notes

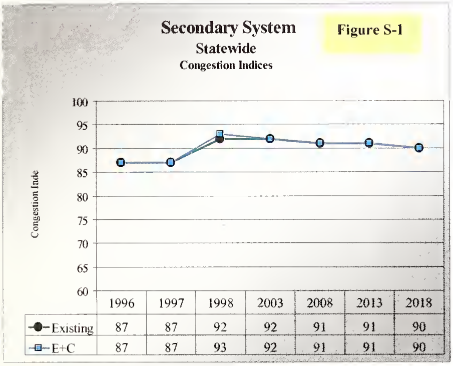
Secondary

General Information

Because none of the Secondary System passes through any of the fourteen urban areas, all routes are considered rural in nature and were analyzed as such.

Existing Network

As illustrated in **Figures S-1**, the overall, statewide existing network CI is currently 92 (LOS A) and, as expected, will not fall below a CI of 90 (LOS A) within the next 20 years.



	1996	1997	1998	2003	2008	2013	2018
● Existing	87	87	92	92	91	91	90
▢ E+C	87	87	93	92	91	91	90

The CI *increase* from 1997 to 1998 was unexpected but upon investigation it was found that the fluctuation is due largely to changes in traffic volumes. Traffic on the low volume roads are more susceptible to large swings in the traffic volume from year to year thereby causing shifts in the CIs.

E+C Network

The E+C Network consists of the existing highway infrastructure plus any capacity enhancing projects in the most current STIP. The following projects are from the 1998-2000 STIP. This list includes ***only*** those with potential capacity enhancing features:

	Project Name	Route	Length
1	Highwood-NE	S-228	3.621
2	Brown's Gulch Road	S-276	2.4
3	Big Timber-South	S-298	3.1
4	Ulm South (South Sec.)	S-330	7.8
5	Whitetail Road	S-399	10.1
6	Plevna-South	S-494	7.4
7	Foy Canyon Road	S-503	3.78

Individual Secondary Routes

Figure S-2 (see pages 35-40) illustrates the Existing and E+C network CI by individual routes.

District Comparisons

Figures S-3 through **S-8** (see page 41) compare the overall Secondary system CIs in each of the districts.

Figure S-9 through **S-13** (see pages 42-46) are maps which illustrate CIs on the existing highway network for the entire Secondary system for the years 1998 through 2018 in five year increments.

Hot Spots

Figures S-14 and **S-15** (see page 47) have been developed to better illustrate segments of the Secondary system that currently have or are projected to have service levels of less than C. Only the 1998 and 2018 maps for the existing highway networks are shown in this report. Interim year maps for the Existing and E+C networks are available from the Data and Statistics Bureau.

Figures S-16 and **S-17** (see page 48) compare the total number of miles of Secondary in each district against the number of miles of Secondary operating below a CI of 55 (less than LOS C).

Missing Data Report

Due to the unavailability of inventory data, some of the routes on the Secondary system could not be analyzed. It should be understood that the CIs for these routes were not considered in the analysis either at the statewide or district level. Every attempt will be made to gather the data and include the analysis for these routes in the 1999 CMS report.

The routes which were not available for this report are as follows:

Route	**Length**	**Route**	**Length**	**Route**	**Length**
S-204	1.6	S-292	9.4	S-426	26.8
S-236	89.6	S-326	1.7	S-532	15.9
S-237	1.4	S-342	.9		

October 1999

Figure S-2

Secondary System
Individual Routes
Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
201	93	95	95		95		95		95		95	
202	91	91	92		91		90		90		90	
203	75	76	69		66		93		59		56	
204												
205	74	93	71		66		90		94		61	
206	94	95	68		74		91		57		53	
207	99	86	98		88		94		98		98	
208	96	95	97		97		87		97		96	
209	65	68	66		94		94		59		56	
210	88	86	98		82		80		77		74	
211	98	77	77		88		74		73		71	
212	85	86	85		94		92		81		79	
213	99	86	98		89		88		97		87	
214	94	95	95		98		94		94		94	
215	93	93	98		90		88		94		89	
217	94	99	98		98		98		98		98	
218	96	86	95		88		94		94		94	
219	95	94	93		93		92		92		91	
220	93	93	92		98		90		89		88	
221	92	92	92		88		90		94		88	
222	96	86	79		77		76		74		72	
223	92	93	93		93		93		93		92	
224	93	93	97		97		97		97		96	
225	65	86	95		95		95		95		94	
226	93	91	98		88		89		94		88	
227	98	86	87		90		89		85		84	
228	94	93	93		94		91		90		90	
229	76	68	76		73		71		98		66	
231	74	68	95		91		88		54		50	
232	94	93	93		93		92		92		91	
233	94	95	69		98		98		98		97	
234	89	86	96		82		87		88		86	
235	85	95	98		98		87		95		84	
236												
237												
238	94	94	93		93		93		92		92	
239	96	95	95		95		94		94		94	
240	91	87	98		98		87		87		86	
241	94	94	93		93		92		92		92	
243	98	98	97		97		97		97		97	
244	95	95	94		94		94		93		93	

Secondary System

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
245	99	98	93		97		97		96		96	
246	94	94	93		64		64		93		93	
247	99	99	99		88		99		88		99	
248	95	94	93		93		93		92		92	
249	94	99	87		96		86		85		85	
250	93	94	93		93		93		92		92	
251	97	97	94		64		97		64		96	
252	99	96	96		95		95		95		95	
253	97	97	96		96		95		95		95	
254	95	95	95		93		64		64		94	
255	86	94	96		88		86		95		95	
257	82	80	81		86		80		88		78	
258	91	90	89		88		88		86		87	
259	95	95	96		93		86		95		95	
260	78	77	74		73		72		70		69	
261	97	97	96		96		86		86		96	
263	78	74	78		64		66		64		62	
269	78	74	69		65		91		57		52	
271	95	96	99		93		93		92		92	
272	78	78	74		72		64		67		65	
273	99	84	83		93		92		97		89	
275	72	71	69		64		64		64		63	
276	92	91	99		88		64		86		85	
277	99	96	96		88		93		88		98	
278	99	92	99		88		88		88		87	
279	78	91	74		77		75		72		69	
280	80	74	90		88		77		75		73	
282	78	74	74		98		67		65		64	
283	95	84	93		93		92		64		91	
284	82	96	92		92		91		88		90	
285	94	90	99		93		93		92		92+	
286	99	91	96		88		88		88		85	
287	86	84	83		91		79		79		73	
288	99	84	83		91		88		77		74	
290	92	89	89		88		64		86		84	
291	**43**	**42**	**34**		**32**		**29**		**88**		**17**	
292												
294	97	97	96		95		95		95		94	
295	95	94	93		92		92		91		91	
297	98	98	98		98		97		97		97	
298	85	86	85		84		84		84		83	
300	97	97	96		96		96		96		96	

Secondary System

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
302	95	84	96		80		80		96		87	
306	91	91	96		96		87		94		84	
308	98	98	94		94		93		91		79	
310	98	98	96		93		88		93		97	
311	98	98	96		86		86		86		95	
313	98	98	97		87		87		86		86	
314	90	91	94		97		97		97		86	
317	62	64	94		87		53		93		45	
320	98	98	97		97		96		96		96	
322	97	95	94		93		93		93		93	
323	98	97	94		88		97		97		97	
324	93	98	94		93		92		91		90	
325	98	98	97		97		97		97		96	
326												
327	98	98	98		88		93		97		98	
328	98	98	94		96		96		96		99	
330	95	98	94	94	93	94	92	93	92	92	91	92
331	98	98	94		96		94		94		85	
332	98	98	98		93		93		97		97	
334	95	95	94		91		97		96		90	
335	98	98	96		86		96		96		96	
336	98	98	94		80		96		96		99	
338	98	98	96		97		97		97		97	
340	98	98	97		97		97		97		97	
341	98	100	94		80		96		96		99	
342												
343	97	97	97		97		97		97		97	
344	98	98	94		95		95		93		94	
345	93	98	96		77		77		77		73	
346	98	98	82		91		80		78		76	
347	84	84	82		80		78		77		75	
348	98	98	96		96		95		93		93	
350	98	97	97		97		97		97		96	
352	62	98	94		92		92		96		79	
354	91	91	94		96		96		95		87	
357	93	95	92		92		91		96		89	
358	98	95	94		93		93		93		92	
359	98	98	94		95		86		96		93	
360	62	98	94		96		96		97		97	
363	98	98	96		96		80		96		80	
365	98	98	96		96		95		91		91	
366	97	97	98		97		97		97		97	

Secondary System

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
370	84	84	97		79		79		71		67	
373	78	84	99		85		80		80		53	
374	84	98	94		99		99		99		93	
379	97	97	97		94		97		85		96	
381	97	96	95		85		94		94		94	
382	92	92	94		99		80		85		89	
384	83	84	94		83		83		82		92	
386	83	83	94		83		82		82		81	
387	84	84	97		97		80		85		86	
391	97	97	97		97		94		85		96	
393	84	83	84		82		85		79		76	
396	84	84	99		85		85		85		97	
399	84	98	99		99		85		85		88	
400	84	84	99		80		80		80		98	
401	97	97	99		80		85		85		84	
405	98	97	99		85		97		97		97	
408	93	92	94		80		80		80		89	
409	98	84	99		85		85		85		98	
411	84	84	73		71		85		85		62	
412	84	84	94		80		99		57		55	
413	84	84	99		80		99		99		99	
416	78	78	97		97		85		64		62	
417	97	97	97		94		94		94		97	
419	97	97	82		80		79		77		75	
420	84	84	94		80		83		82		82	
421	84	84	97		85		85		85		84	
422	84	97	99		85		99		99		93	
424	72	72	99		83		85		57		53	
426												
427	97	97	99		85		85		85		96	
429	84	64	99		57		54		52		49	
430	72	97	97		64		80		85		51	
431	96	93	93		94		92		92		91	
432	97	97	97		94		94		94		97	
434	97	84	99		85		99		83		82	
435	97	97	99		99		99		83		92	
437	99	84	99		85		97		97		97	
438	84	97	99		97		97		97		97	
444												
444	84	97	97		97		97		85		85	
446	91	91	99		94		94		80		80	
447	97	96	96		95		95		95		95	

Secondary System

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
448	88	98	96		94		98		98		98	
449	99	85	96		98		94		94		97	
451	88	88	87		97		85		84		83	
453	75	75	74		72		83		83		63	
454	75	91	80		88		88		79		78	
457	97	98	96		94		83		98		98	
462	99	98	83		84		83		83		99	
463	88	93	94		83		92		92		92	
464	91	85	86		97		94		96		85	
466	88	91	94		97		83		83		85	
467	88	98	94		97		84		84		99	
470	85	98	96		97		97		97		97	
471	92	93	92		92		91		83		90	
472	85	85	92		80		79		77		75	
473	77	85	76		73		94		67		65	
474	73	85	83		64		83		91		60	
478	88	92	92		92		91		91		91	
480	88	98	86		83		85		85		94	
482	88	97	86		85		84		83		82	
484	97	88	98		97		97		97		97	
486	92	98	96		85		84		83		82	
487	93	62	72		69		64		83		56	
489	88	93	94		84		83		83		93	
493	85	85	96		83		85		94		95	
494	85	99	94		94		94		97		97	
500	85	85	94		97		97		96		96	
503	88	88	83	86	84	85	92	94	91	82	80	81
504	88	98	83		83		83		97		98	
507	85	85	94		83		83		92		82	
508	88	98	94		97		83		83		85	
509	85	98	86		97		97		94		96	
510	85	99	*		83		84		96		98	
511	93	93	94		94		94		94		93	
512	85	99	96		94		94		94		94	
513												
515	93	92	94		83		83		83		93	
516	88	99	96		83		83		85		95	
517	92	93	92		91		91		91		90	
518	77	77	74		72		70		67		64	
522	69	71	68		66		64		61		59	
528	-	-	97		97		97		96		96	
529	97	96	97		96		96		96		96	

Secondary System

Individual Routes

Congestion Indices

Route No.	1996[1] Existing[2]	1997 Existing	1998 Existing	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
531	82	82	84		83		81		83		78	
532												
533	96	93	96		97		86		95		84	
534	97	98	97		97		97		86		96	
537	99	99	96		88		88		88		97	
540	92	91	96		88		97		88		85	
541	99	98	97		97		97		97		97	
543	99	97	98		95		95		95		95	
544	95	95	96		95		95		95		95	
547	98	97	98		88		88		88		95	
548	96	64	62		83		97		50		44	
551	95	93	62		88		81		83		90	
552	99	98	96		88		95		95		95	
556	96	96	96		88		95		95		94	
559	98	82	91		83		86		86		86	
563	98	95	95		95		88		97		93	
564	99	99	98		88		88		88		98	
565	99	82	62		92		88		88		91	
566	96	97	93		93		92		92		92	
567	90	91	90		90		89		89		88	
568	92	95	92		91		91		91		90	

Those Cl's in red reflect congestion indices of LOS D or lower (Cl <55)

* S-510 Dropped from secondary system as of System Action dated 4/15/99 - Cl's are from 1997 data

[1] Traffic year

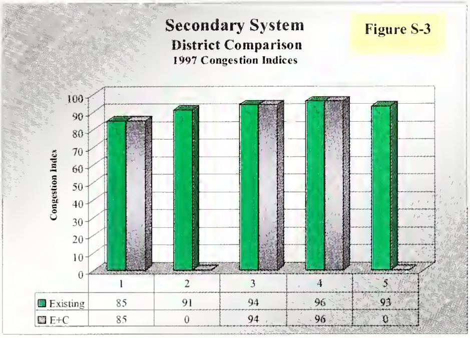
[2] Existing Highway Network

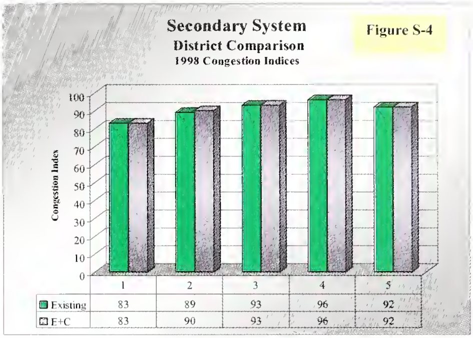
[3] Existing plus Committed Highway Network

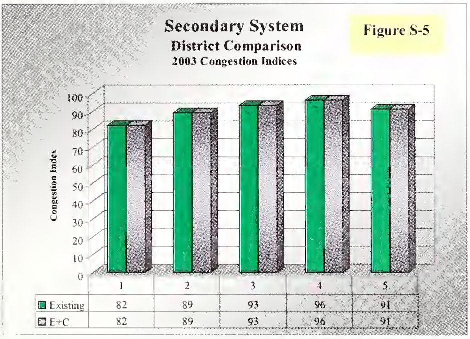
▨ No capacity enhancing projects planned for this route

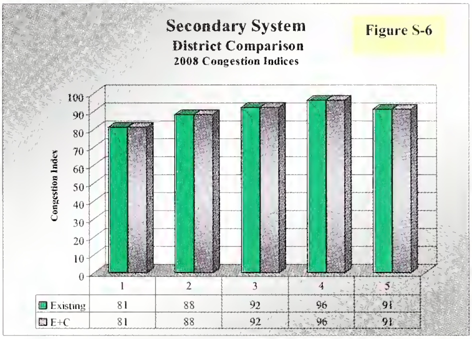
☐ No general inventory data available; no Cls were computed

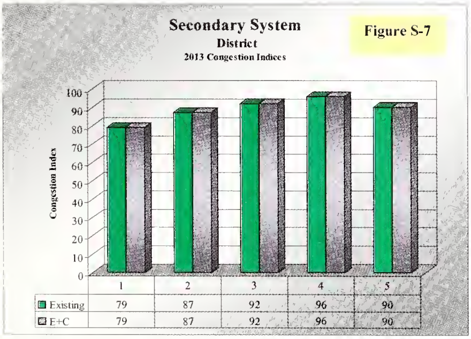
Secondary

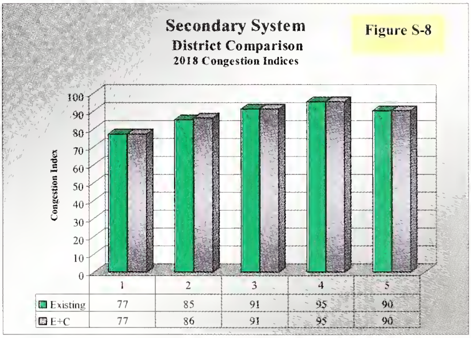






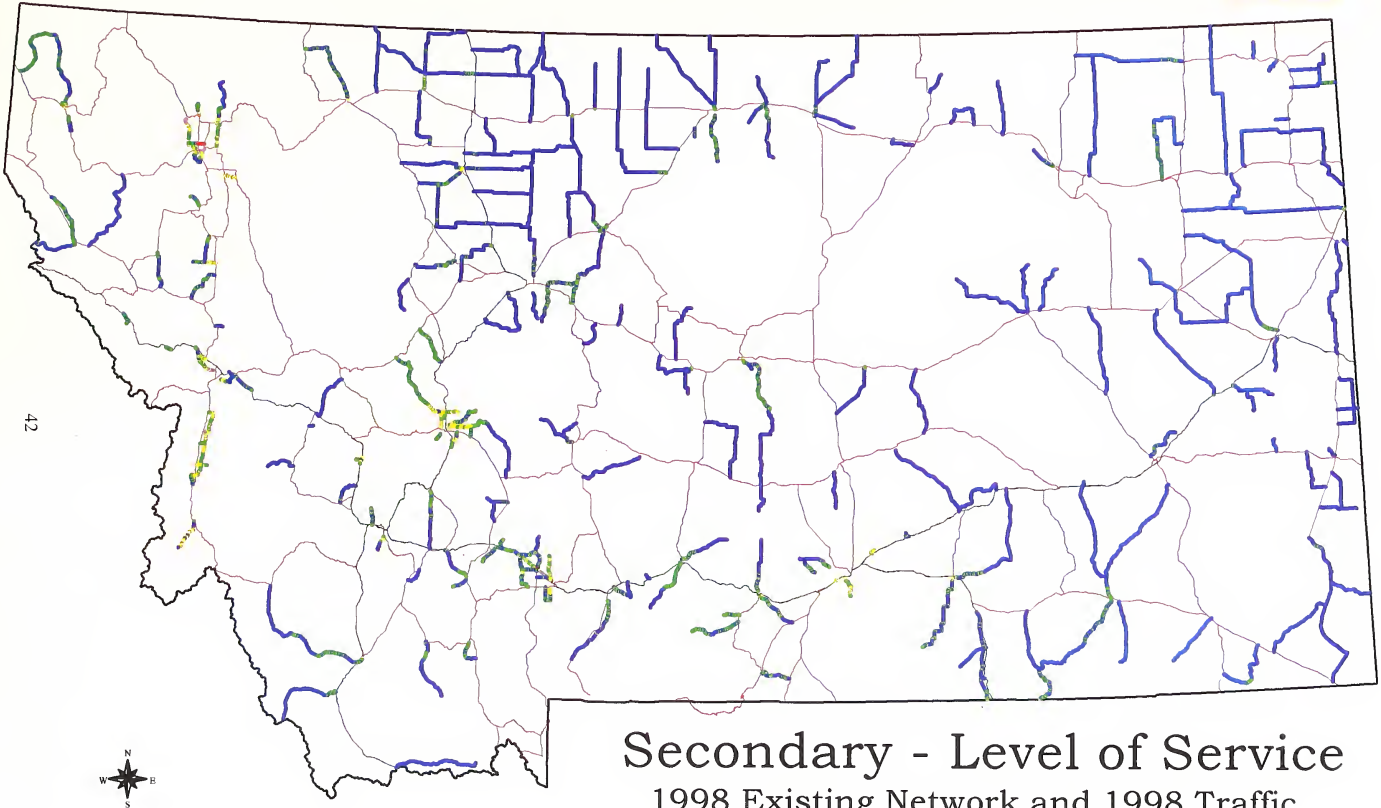






0's in the committed rows indicate that there were no capacity enhancing projects planned for this district. Therefore, no CIs were calculated.

Figure S-9



Secondary - Level of Service

1998 Existing Network and 1998 Traffic

🟦	Level of Service A	🟪	Level of Service D
🟩	Level of Service B	🟥	Level of Service E
🟨	Level of Service C	⬛	Level of Service F

Data and Statistics Bureau

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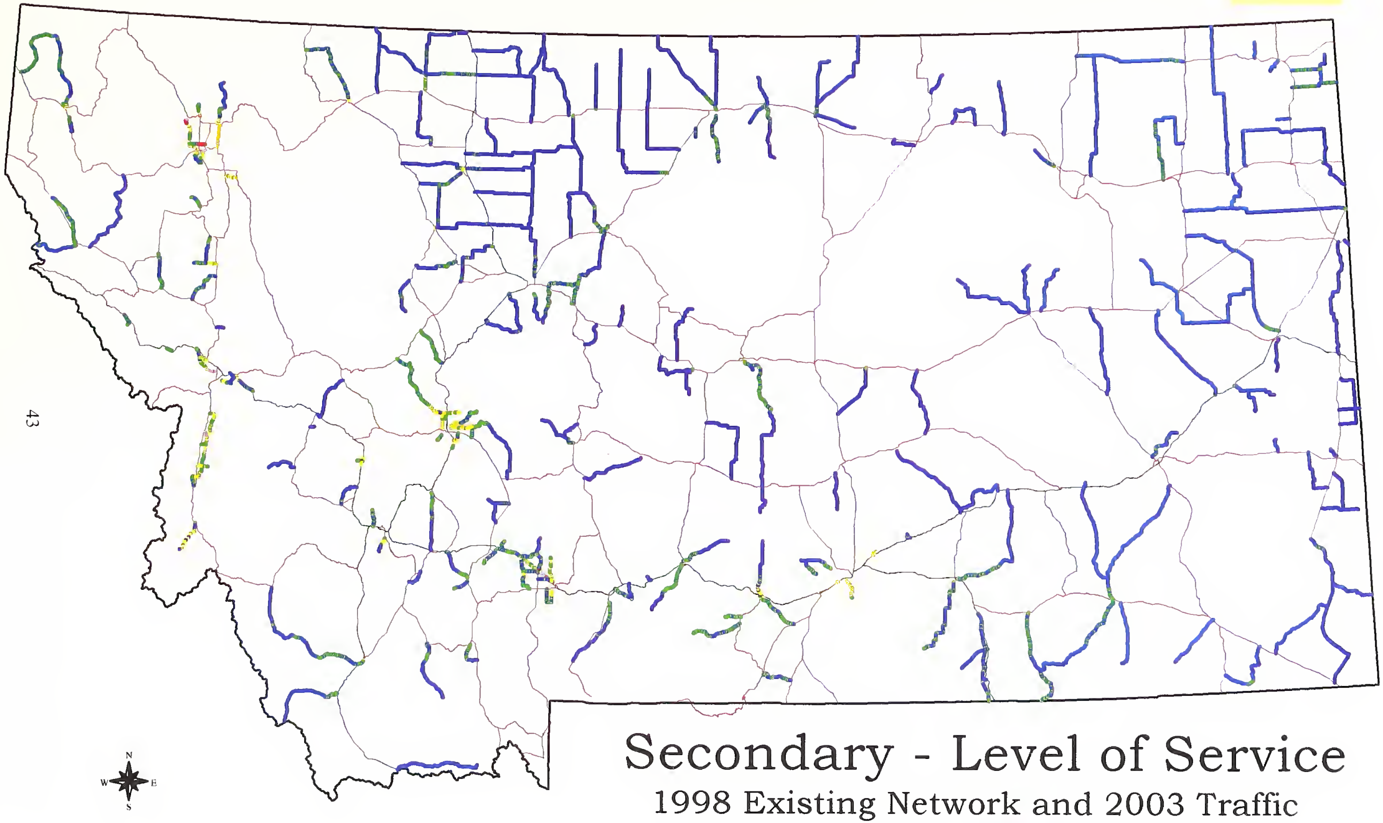
Figure S-10



Secondary - Level of Service

1998 Existing Network and 2003 Traffic

Level of Service A	Level of Service D
Level of Service B	Level of Service E
Level of Service C	Level of Service F

Data and Statistics Bureau

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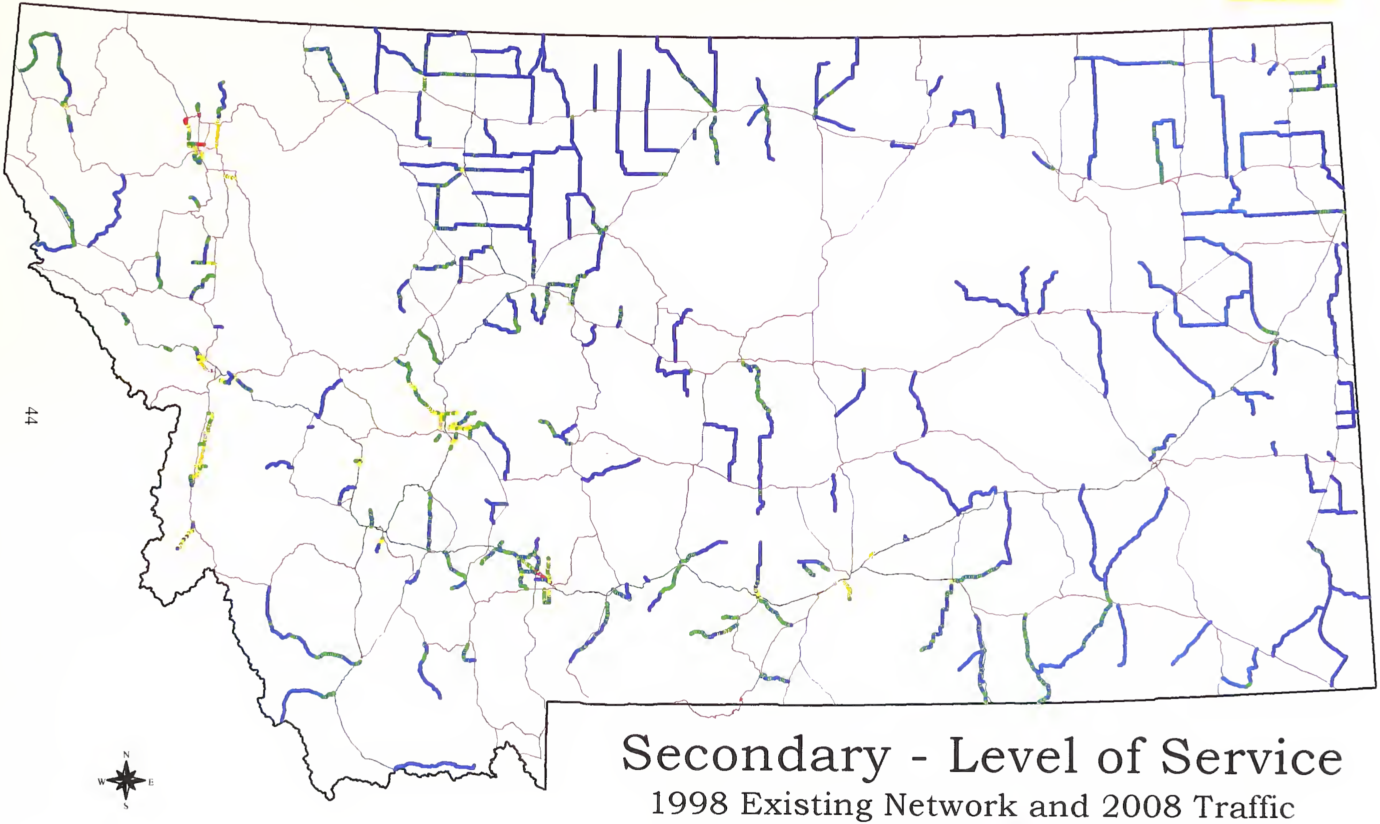
Figure S-11



Secondary - Level of Service

1998 Existing Network and 2008 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

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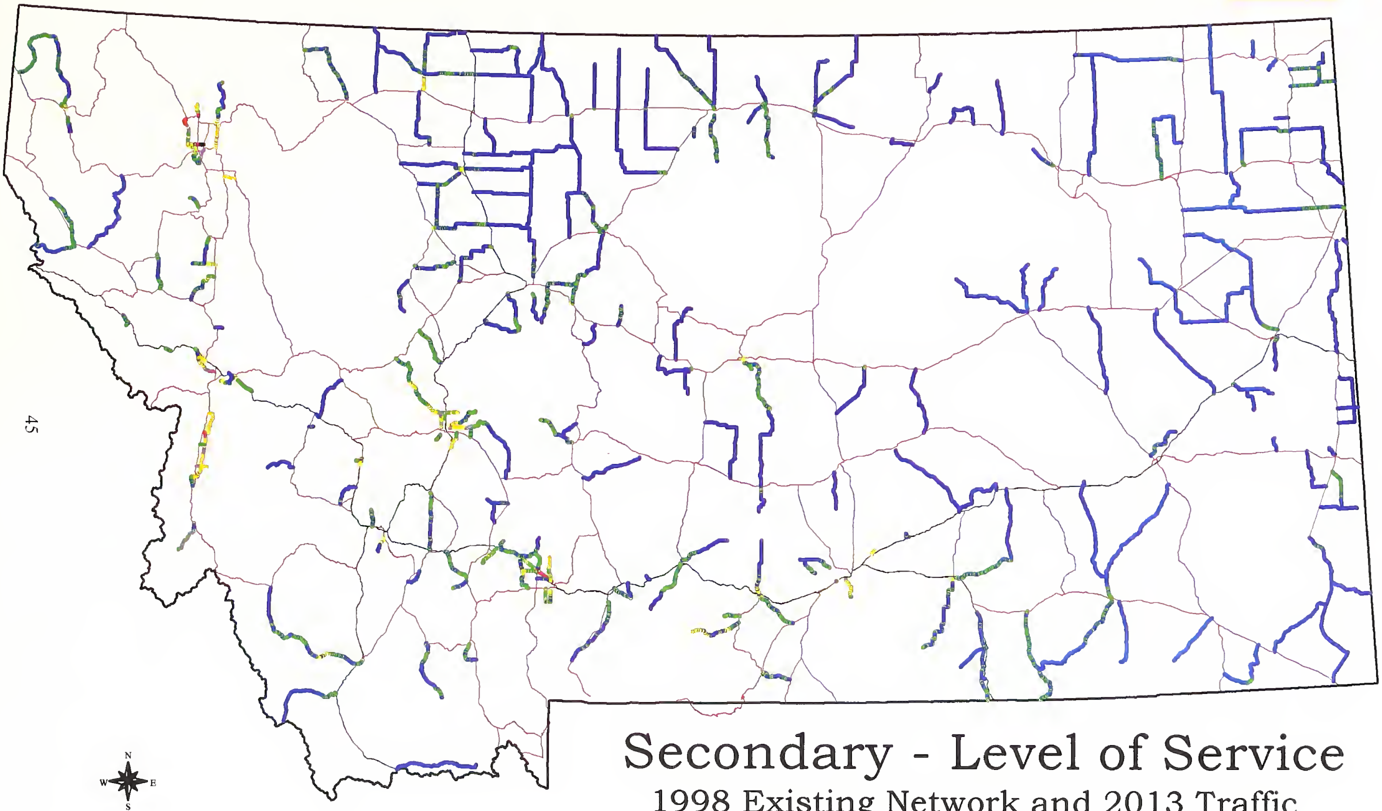
Data and Statistics Bureau

Figure S-12



Secondary - Level of Service

1998 Existing Network and 2013 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F

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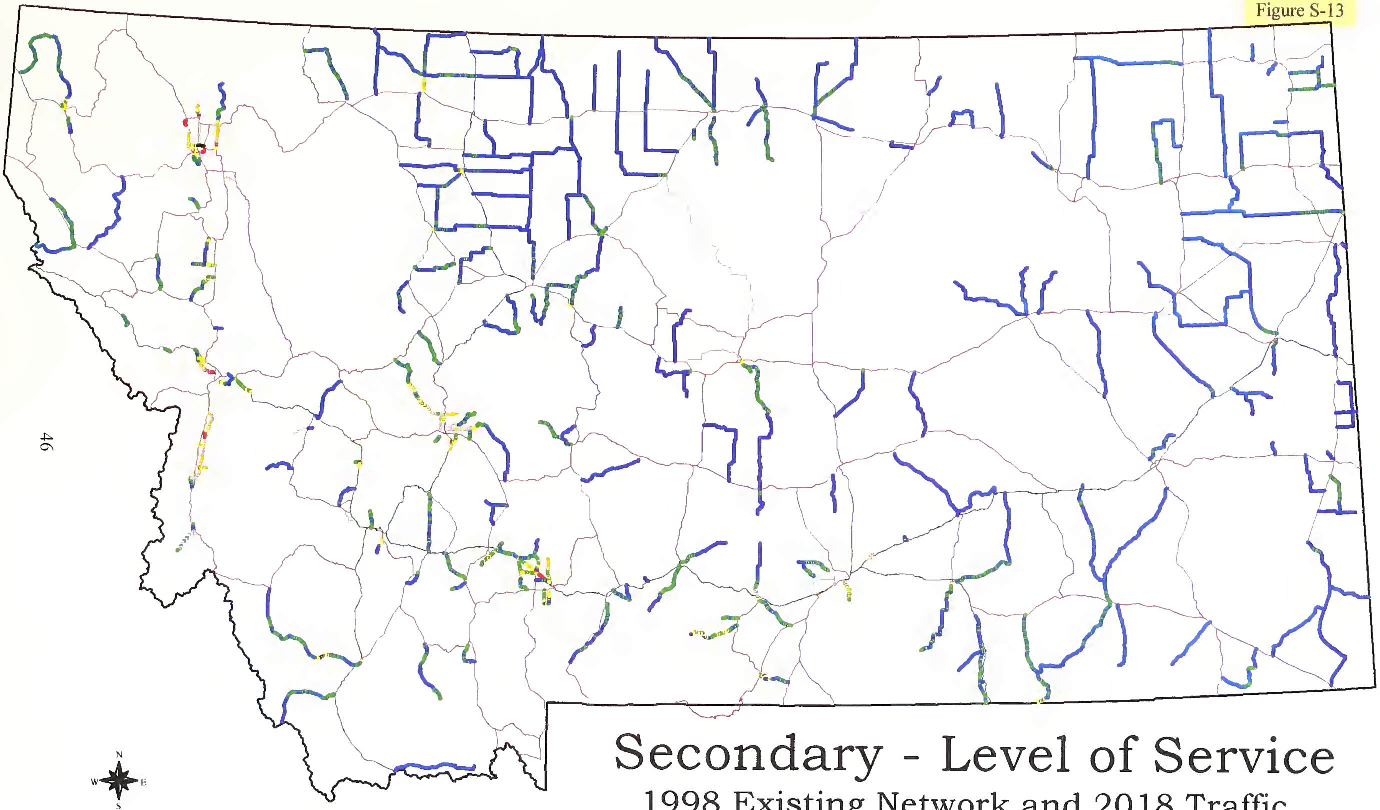
Data and Statistics Bureau

Figure S-13



Secondary - Level of Service

1998 Existing Network and 2018 Traffic

Level of Service A

Level of Service B

Level of Service C

Level of Service D

Level of Service E

Level of Service F

Data and Statistics Bureau

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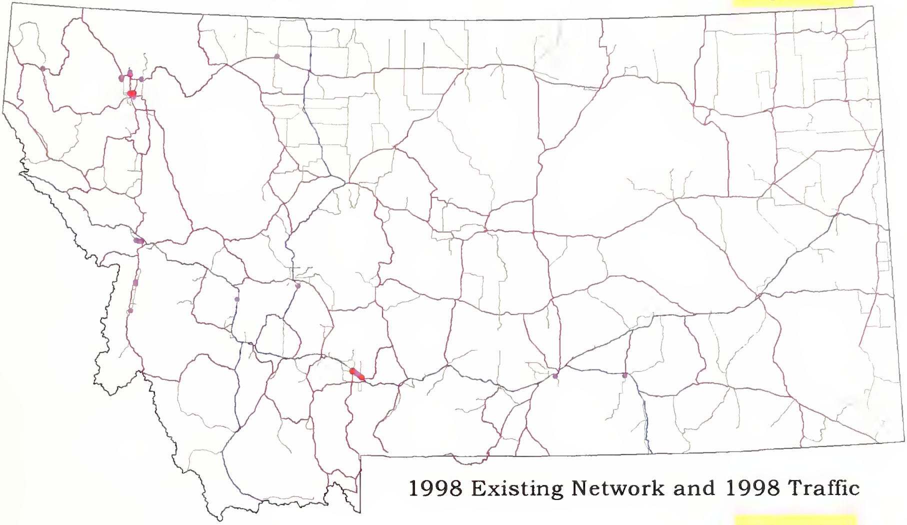
Secondary
Level of Service "Hot Spots"

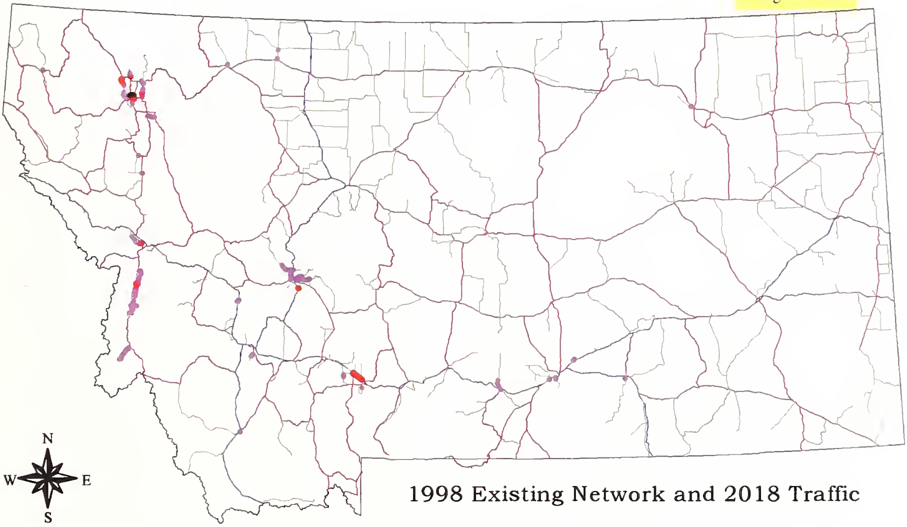
(Congestion Index < 55 - LOS of D or lower)

Figure S-14



1998 Existing Network and 1998 Traffic

Figure S-15



1998 Existing Network and 2018 Traffic

Level of Service A
Level of Service B
Level of Service C
Level of Service D
Level of Service E
Level of Service F
Interstate
NI-NHS & Primary
Secondary

Data and Statistics Bureau

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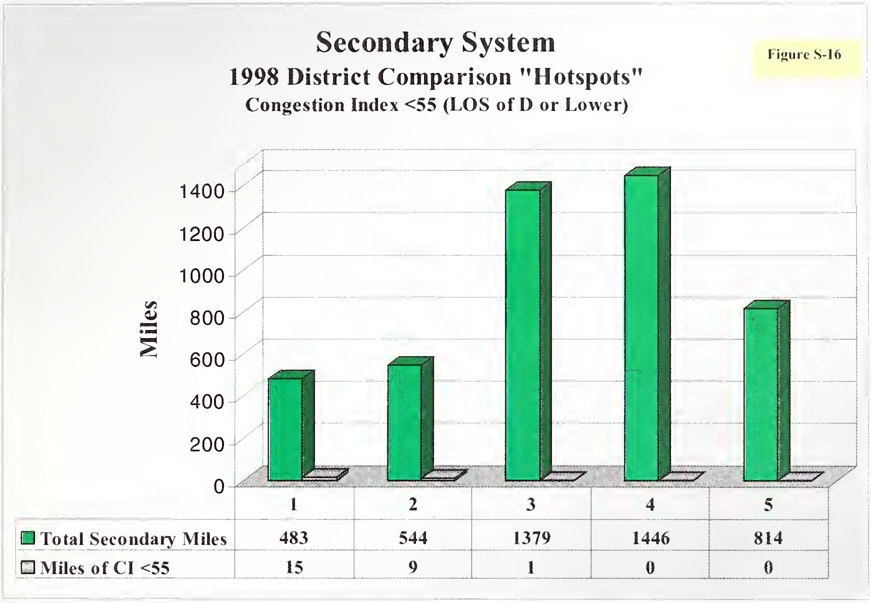

Figure S-16

Secondary System
1998 District Comparison "Hotspots"
Congestion Index <55 (LOS of D or Lower)

	1	2	3	4	5
🟩 Total Secondary Miles	483	544	1379	1446	814
☐ Miles of CI <55	15	9	1	0	0

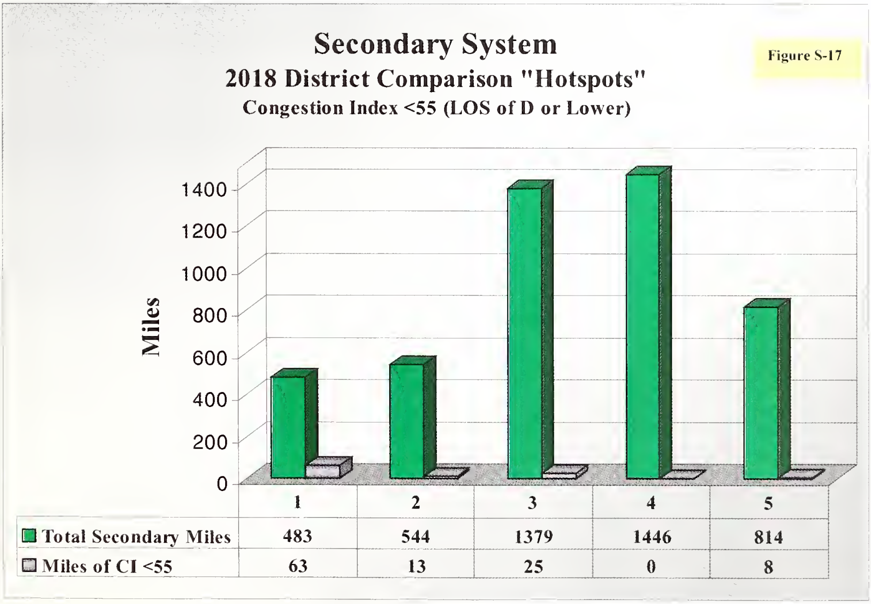

Figure S-17

Secondary System
2018 District Comparison "Hotspots"
Congestion Index <55 (LOS of D or Lower)

	1	2	3	4	5
🟩 Total Secondary Miles	483	544	1379	1446	814
☐ Miles of CI <55	63	13	25	0	8

6

Notes

State Highway System

General Information

In order to keep the State Highway System congestion analysis manageable, only State Highways of >= 1 mile in length were analyzed.

Existing Network

As illustrated in **Figures SH-1**, the overall, statewide existing network CI is currently 89 (LOS A) and, as expected, will not fall below a CI of 86 (LOS A) within the next 20 years. Because traffic and inventory data was not available, a CI was not calculated for previous years.

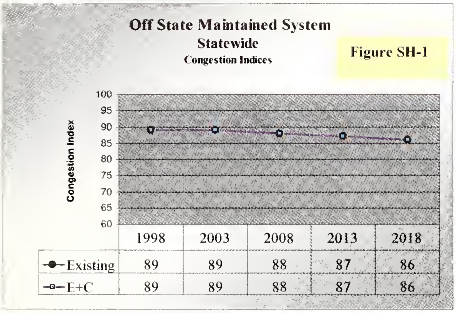
Figure SH-1

E+C Network

The E+C Network consists of the existing highway infrastructure plus any capacity enhancing projects in the most current STIP. There were no State Highway projects identified in the 1998-2000 STIP.

Individual State Highway Routes

Figure SH-2 (see pages 50-51) illustrates the Existing and E+C network CI by individual routes.

District Comparisons

Figures SH-4 through **SH-8** (see page 52) compare the overall State Highway System CIs in each of the districts.

Figure SH-9 through **SH-13** (see pages 53 - 57) are maps which illustrate CIs on the existing highway network for the entire State Highway System for the years 1998 through 2018 in five year increments.

Hot Spots

Figures SH-14 and **SH-15** (see page 58) have been developed to better illustrate segments of the State Highway System that currently have or are projected to have service levels of less than C. Only the 1998 and 2018 maps for the existing highway networks are shown in this report. Interim year maps for the Existing and E+C networks are available from the Data and Statistics Bureau.

Figures SH-16 and **SH-17** (see page 59) compare the total number of miles of State Highway in each district against the number of miles of State Highway operating below a CI of 55 (less than LOS C).

Missing Data Report

Due to the unavailability of data, either inventory or traffic, some of the routes on the State Highway System could not be analyzed. It should be understood that the CIs for these routes were not considered in the analysis either at the statewide or district level. Every attempt will be made to gather the data and include the analysis for these routes in the 1999 CMS report.

Due to the large number of routes that were unable to be analyzed for this report, the individual route numbers and lengths were not listed out.

State Highways

October 1999

Figure SH-2

Individual Routes

Congestion Indices

Route No.	1998[1] Existing[2]	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
X-2315										
X-2325										
X-7541										
X-7602	92		92		99		99		90	
X-7603	88		99		86		86		84	
X-7611	71		99		86		63		59	
X-9003	95		86		99		94		93	
X-9205	99		99		99		99		99	
X-11315	89		99		99		88		88	
X-12146	98		99		99		97		96	
X-15516										
X-16565	88		99		86		85		83	
X-18203	68		67		66		65		64	
X-20011	95		94		94		94		93	
X-20013	83		82		82		81		80	
X-22244										
X-22245										
X-22249	88		86		85		84		82	
X-22250	87		87		86		86		85	
X-22252	99		99		99		99		99	
X-22253	99		99		98		98		98	
X-22925	84		83		82		81		80	
X-25295	85		84		82		81		80	
X-31007	92		92		91		91		90	
X-31011										
X-31070	88		88		87		87		86	
X-31203	97		97		97		96		96	
X-32200	61		58		55		53		50	
X-34372										
X-34448	99		99		99		99		99	
X-39092	95		95		94		94		93	
X-39241	96		95		95		94		94	
X-39305										
X-44302	91		90		90		89		89	
X-44303	94		94		94		94		94	
X-45077	87		86		85		84		83	
X-47511	93		92		91		91		90	
X-47548										
X-48244	86		85		84		83		81	

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State Highways

Individual Routes

Congestion Indices

Route No.	1998[1] Existing[2]	1998 E+C[3]	2003 Existing	2003 E+C	2008 Existing	2008 E+C	2013 Existing	2013 E+C	2018 Existing	2018 E+C
X-48245	85		84		83		82		81	
X-49106										
X-49119	99		99		99		99		99	
X-49142	93		93		93		92		92	
X-50222	100		100		100		100		100	
X-56395	86		86		85		84		84	
X-56683	64		59		55		50		44	
X-56788	89		88		87		87		86	
X-81001	90		89		88		87		86	
X-81003	82		81		80		78		76	
X-81004	98		98		98		98		98	
X-81005	98		98		98		98		98	
X-81006	96		95		95		95		95	
X-81007	91		90		90		90		90	
X-81008	85		85		84		83		82	
X-81009										
X-81010	99		99		99		99		99	
X-81011	95		94		94		93		92	
X-81013	88		87		87		86		86	
X-81014	93		93		92		92		92	
X-81015	88		87		86		84		82	
X-81016										
X-81017										
X-81018	94		93		93		93		93	
X-81020	97		97		97		96		96	
X-81021	99		99		98		98		98	
X-81022	89		89		88		87		87	
X-81024	79		78		75		73		70	
X-81064	61		57		53		49		45	

Those CI's in red reflect congestion indices of LOS D or lower (CI <55)

[1] Traffic year

[2] Existing Highway Network

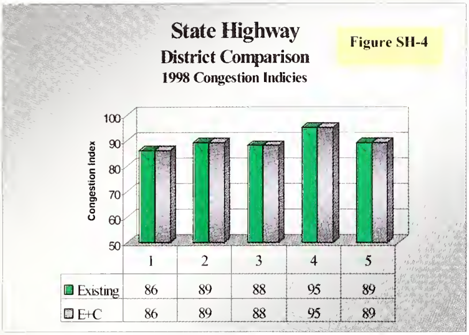
[3] Existing plus Committed Highway Network

▒ No capacity enhancing projects planned for this route

🟦 No general inventory data available; no CIs were computed

🟨 No traffic data available; no CI's were computed

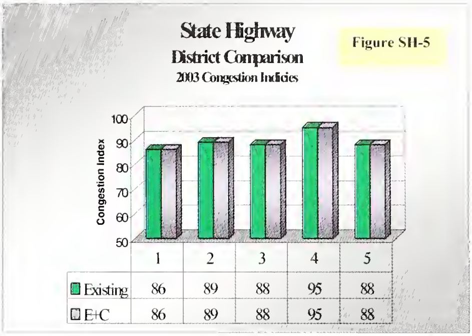
State Highways



State Highway
District Comparison
1998 Congestion Indicies

Figure SH-4

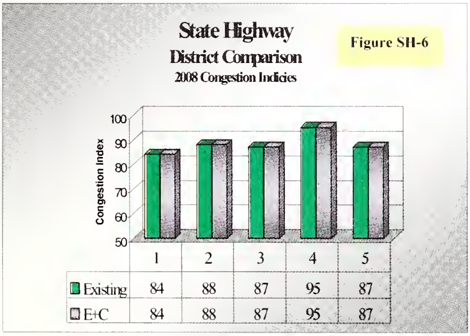
	1	2	3	4	5
🟩 Existing	86	89	88	95	89
☐ E+C	86	89	88	95	89



State Highway
District Comparison
2003 Congestion Indicies

Figure SH-5

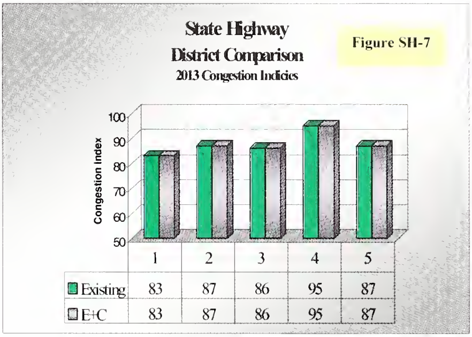
	1	2	3	4	5
🟩 Existing	86	89	88	95	88
☐ E+C	86	89	88	95	88



State Highway
District Comparison
2008 Congestion Indicies

Figure SH-6

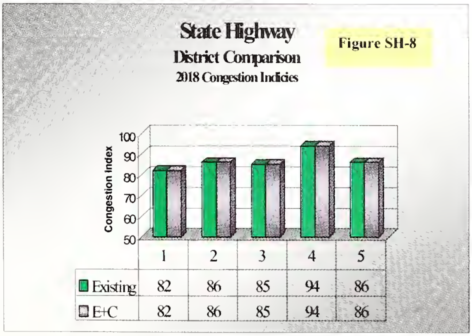
	1	2	3	4	5
🟩 Existing	84	88	87	95	87
☐ E+C	84	88	87	95	87



State Highway
District Comparison
2013 Congestion Indicies

Figure SH-7

	1	2	3	4	5
🟩 Existing	83	87	86	95	87
☐ E+C	83	87	86	95	87

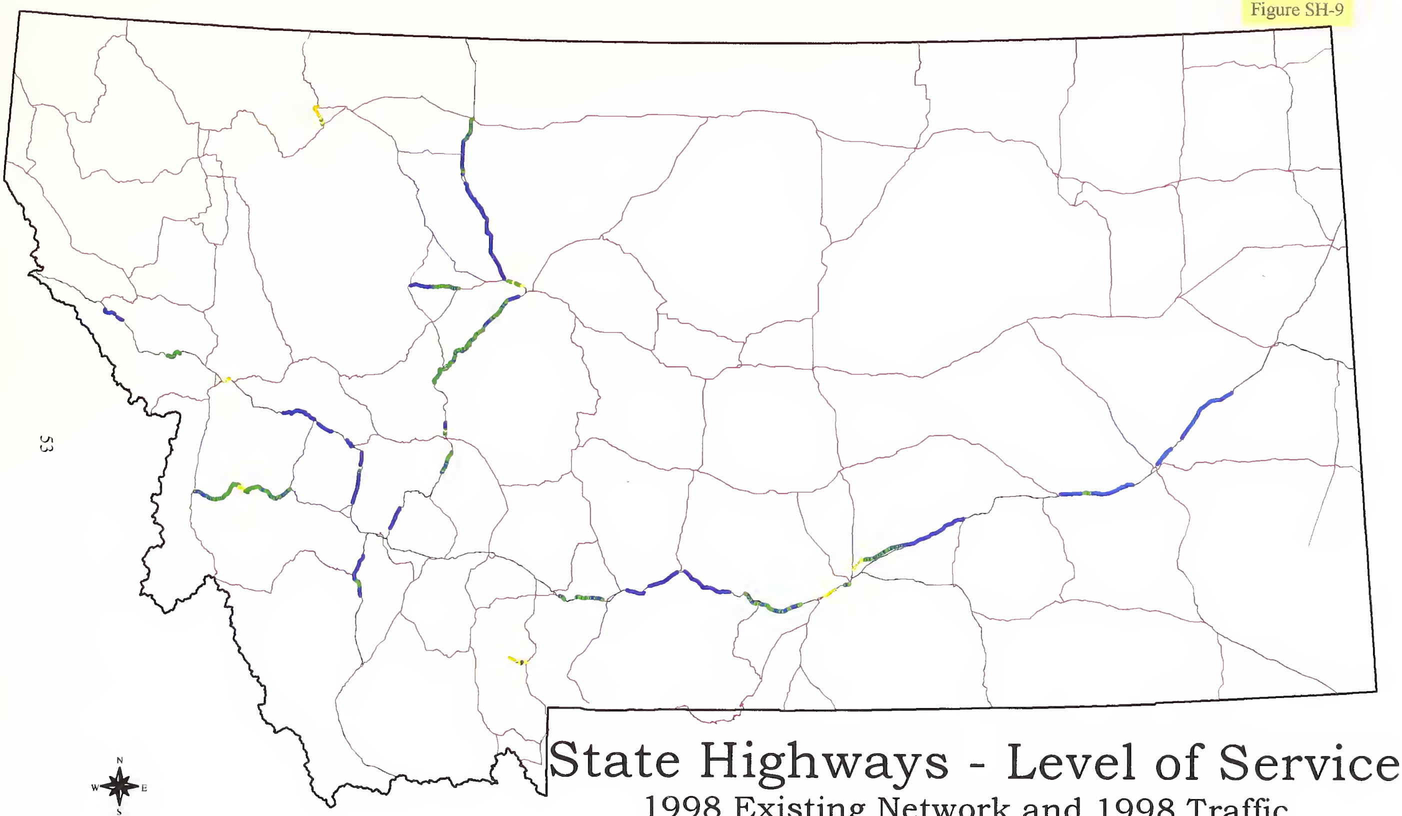


State Highway
District Comparison
2018 Congestion Indicies

Figure SH-8

	1	2	3	4	5
🟩 Existing	82	86	85	94	86
☐ E+C	82	86	85	94	86

Figure SH-9



State Highways - Level of Service

1998 Existing Network and 1998 Traffic

Level of Service A

Level of Service B

Level of Service C

Level of Service D

Level of Service E

Level of Service F

Data and Statistics Bureau

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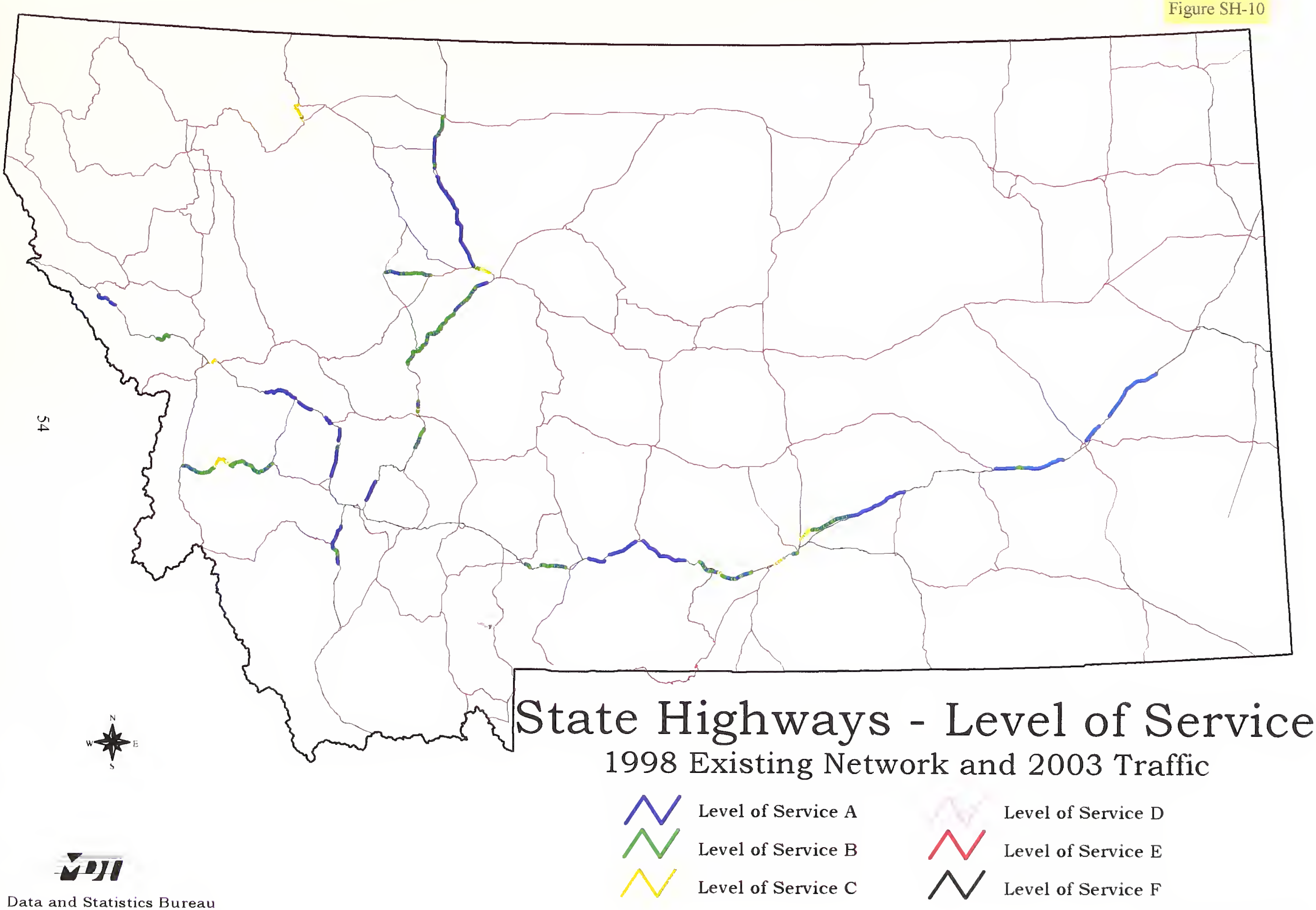
Figure SH-10



State Highways - Level of Service

1998 Existing Network and 2003 Traffic

Data and Statistics Bureau

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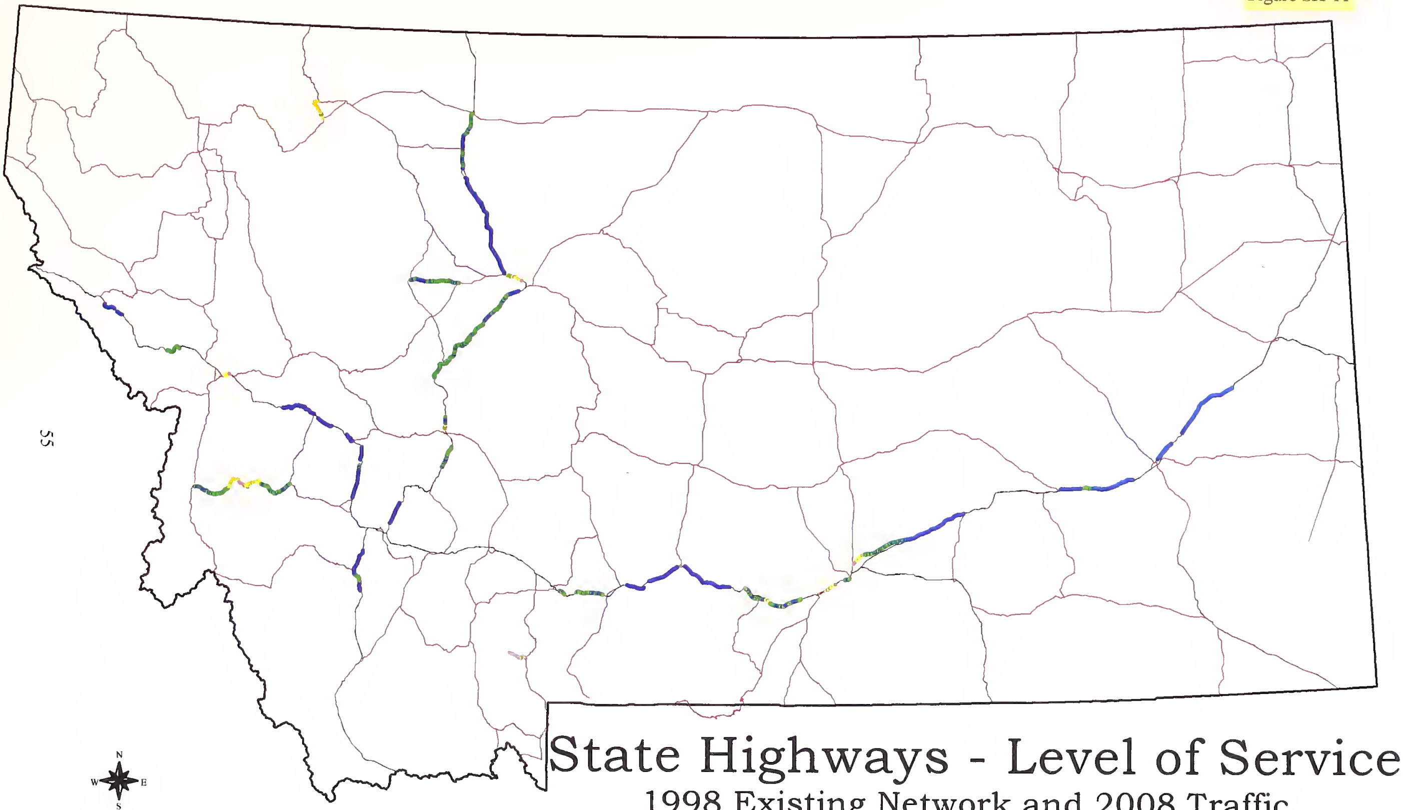
Figure SH-11



State Highways - Level of Service

1998 Existing Network and 2008 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

MDT

Data and Statistics Bureau

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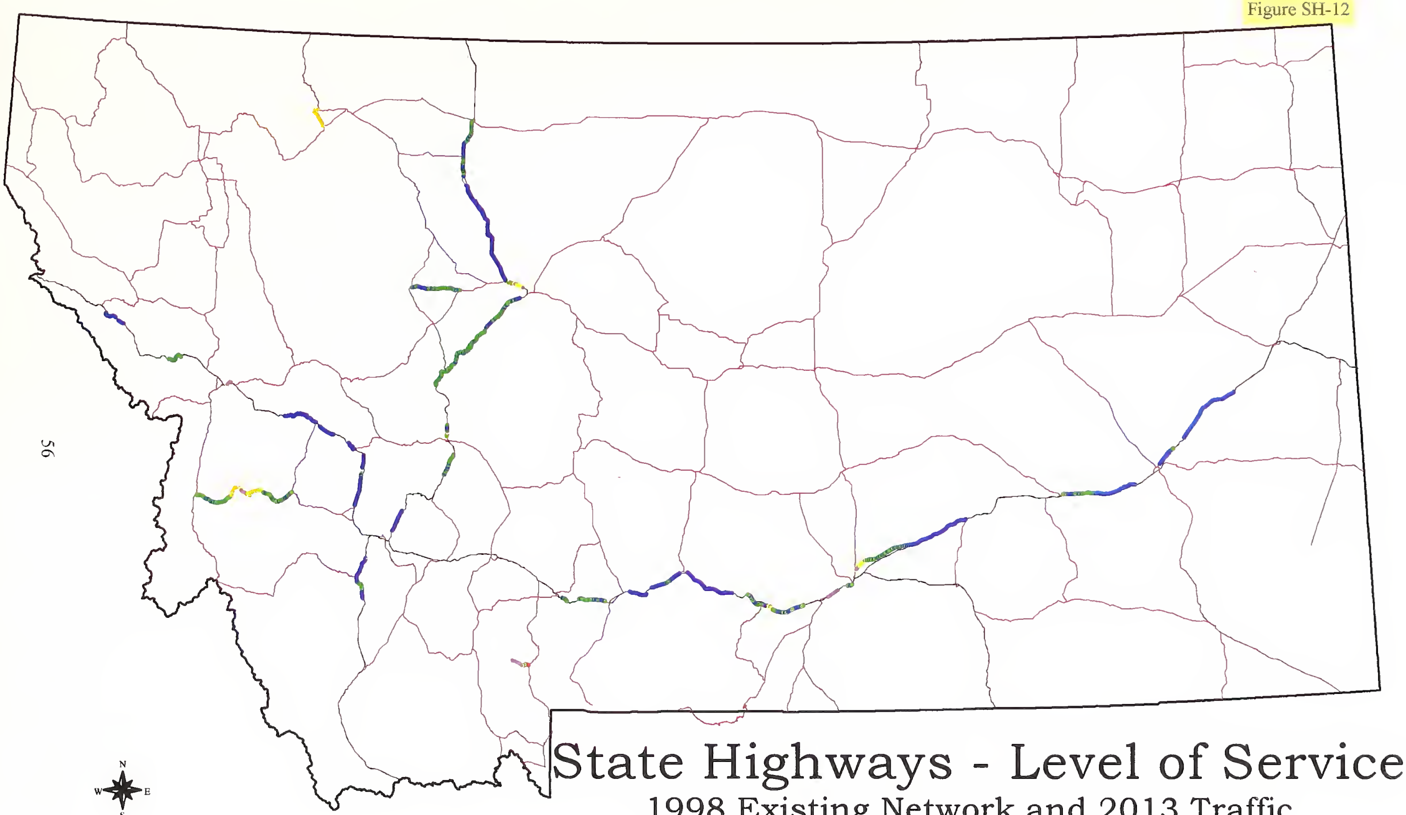
Figure SH-12



State Highways - Level of Service

1998 Existing Network and 2013 Traffic

Data and Statistics Bureau

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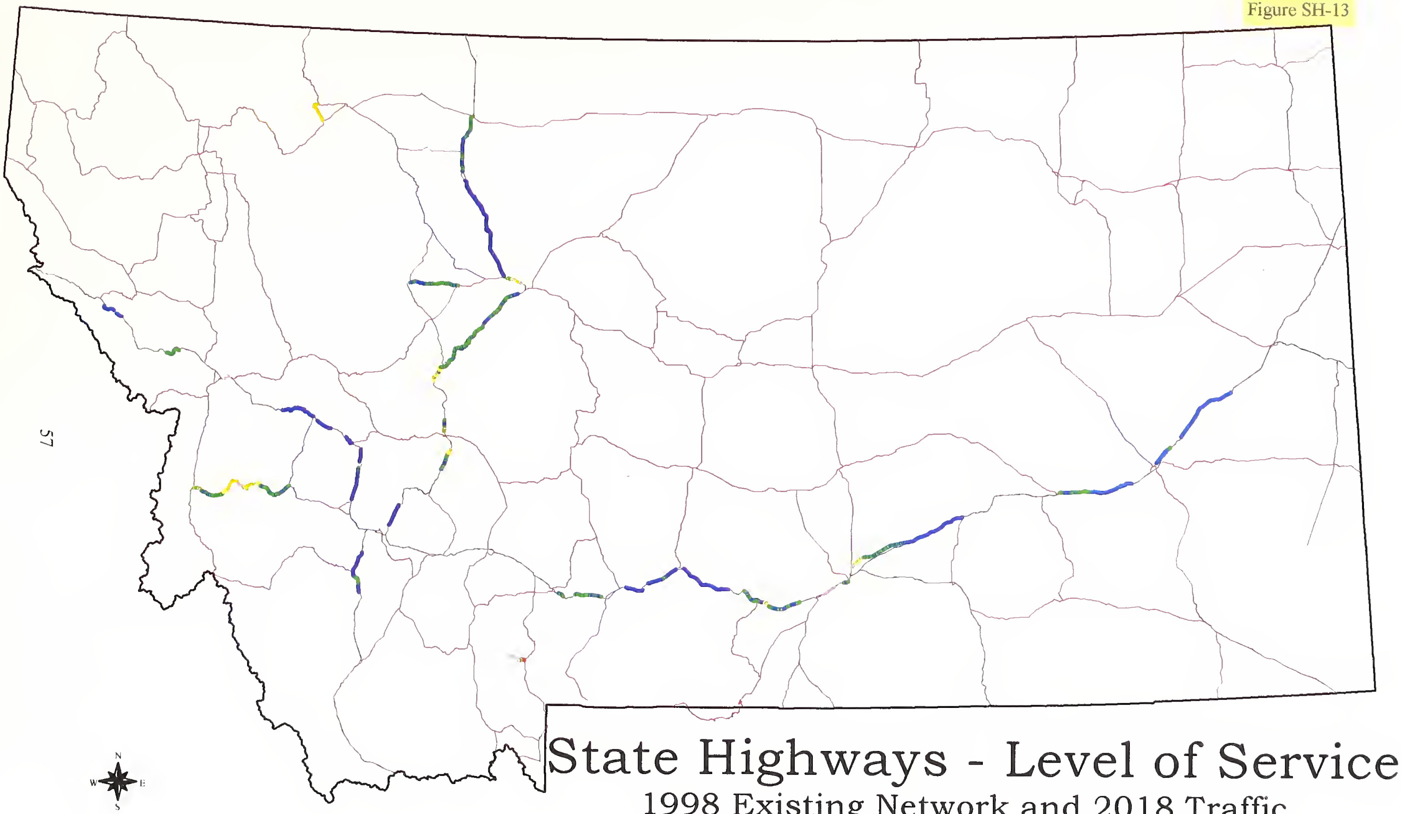
Figure SH-13



State Highways - Level of Service

1998 Existing Network and 2018 Traffic

- Level of Service A
- Level of Service B
- Level of Service C
- Level of Service D
- Level of Service E
- Level of Service F

Data and Statistics Bureau

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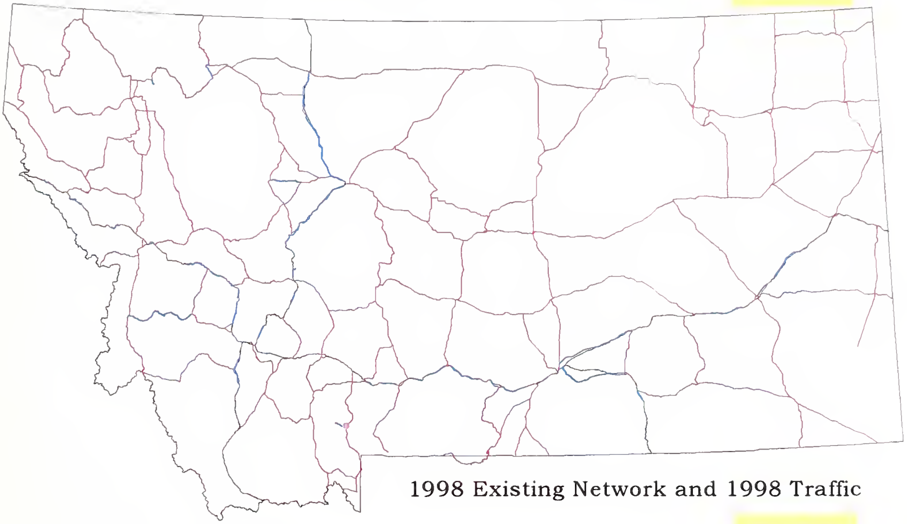
State Highways
Level of Service "Hot Spots"

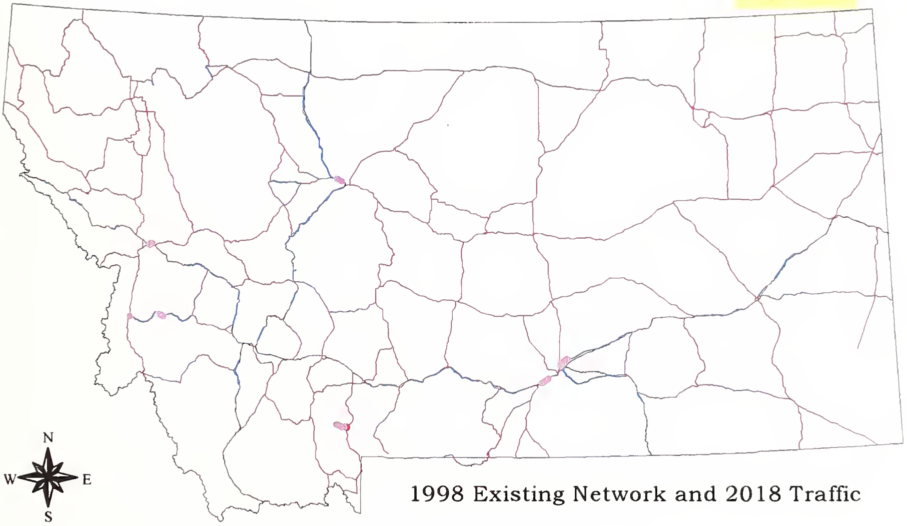
(Congestion Index < 55 - LOS of D or lower)

Figure SH-14



1998 Existing Network and 1998 Traffic

Figure SH-15



1998 Existing Network and 2018 Traffic

Level of Service A	Level of Service D	Interstate
Level of Service B	Level of Service E	NI-NHS & Primary
Level of Service C	Level of Service F	State Highways

Data and Statistics Bureau

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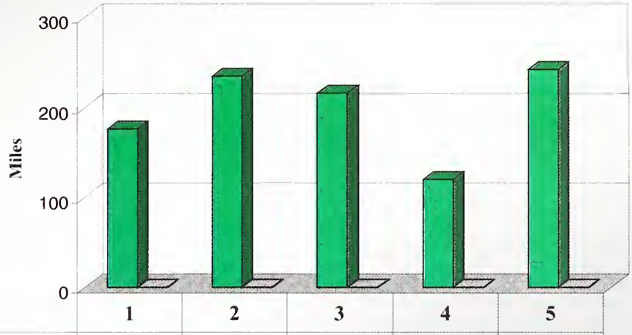
Figure SH-16

State Highway

1998 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)



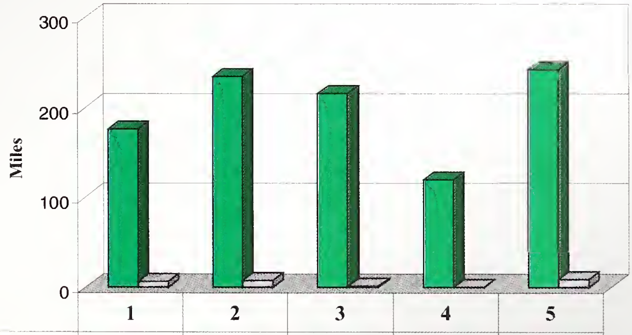
	1	2	3	4	5
🟩 Total State Highway Miles	175	234	215	119	242
☐ Miles of CI < 55	0	0	0	0	0

Figure SH-17

State Highway

2018 District Comparison "Hotspots"

Congestion Index < 55 (LOS of D or lower)



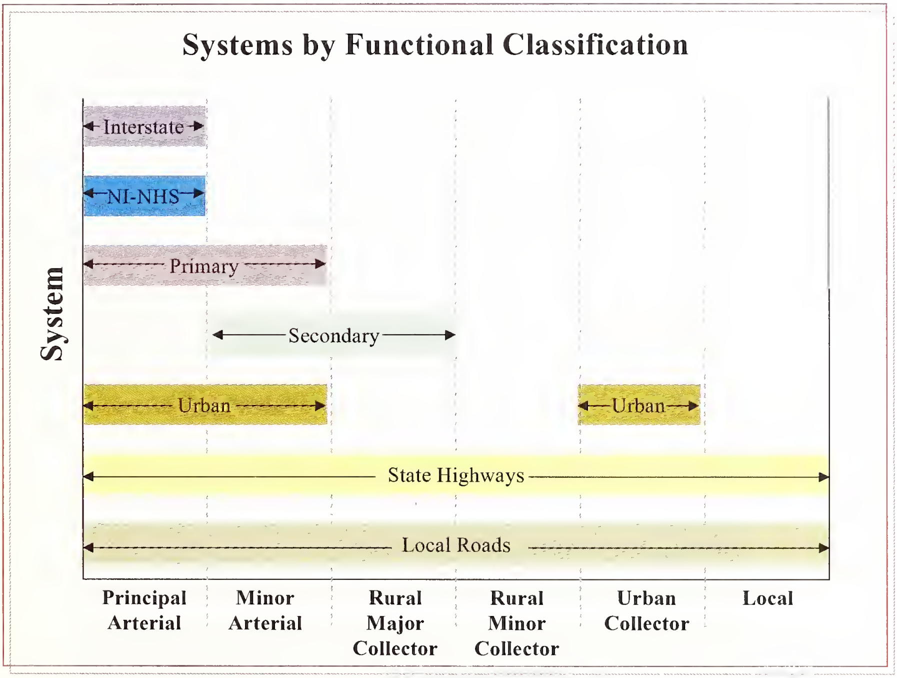
	1	2	3	4	5
🟩 Total State Highway Miles	175	234	215	119	242
☐ Miles of CI < 55	6	7	1	0	9

Notes

Functional Classification

The CMS also calculates CIs by rural functional class groupings.

The following chart displays the functional class group in which each system can be classified:



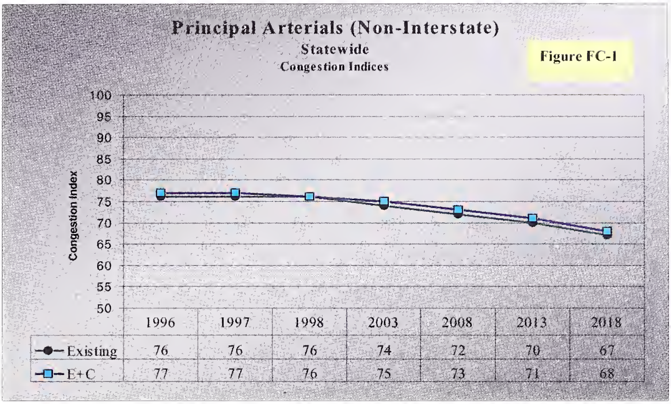
T:\Bill's\Sys_by_Funct_Class

The Interstate system, by definition, consists entirely of principal arterials. Due to it's unique nature, it is usually analyzed based on it's own merit, as is the case within the CMS. Therefore, the Interstate ***System*** results and the functional class results are the same. The Interstate principal arterials are not reported in this section. The analysis of the remaining principal arterials in this section ***do not*** include the Interstate System.

It should be understood that the functional class data herein is reported only to the extent to which it covers the on-system network of highways.

Figures FC-1 through **FC-3** (see page 61) illustrate the statewide CIs by functional class group.

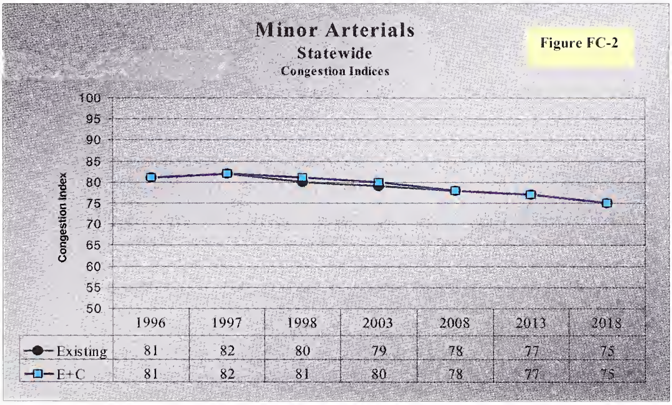
Statewide Functional Classification



Principal Arterials (Non-Interstate)
Statewide
Congestion Indices

Figure FC-1

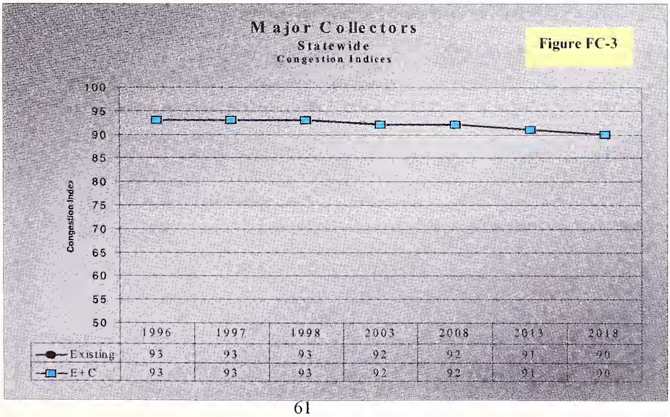
	1996	1997	1998	2003	2008	2013	2018
● Existing	76	76	76	74	72	70	67
■ E+C	77	77	76	75	73	71	68



Minor Arterials
Statewide
Congestion Indices

Figure FC-2

	1996	1997	1998	2003	2008	2013	2018
● Existing	81	82	80	79	78	77	75
■ E+C	81	82	81	80	78	77	75



Major Collectors
Statewide
Congestion Indices

Figure FC-3

	1996	1997	1998	2003	2008	2013	2018
● Existing	93	93	93	92	92	91	90
■ E+C	93	93	93	92	92	91	90

Special Facilities

Special facilities are defined as any group of routes, individual routes, partial routes, or route segments on the rural system for which anyone desires congestion index information.

The CMS has the capability to calculate current and future year CIs on the Existing and E+C highway systems for current and future year scenarios.

For example, when the Districts are nominating projects, they may want to know what effect a reconstruction project might have on the level of service on a certain segment of highway. Given the location and proposed geometrics of the project, CMS can calculate the CI under a **"what if"** scenario and compare the results to the same segment of road under the existing conditions.

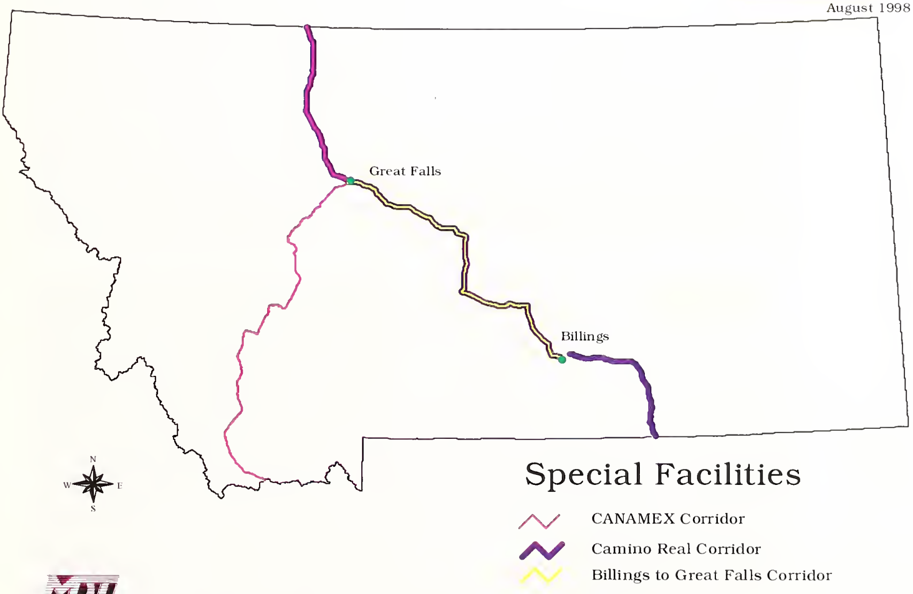
Another use may be for planning purposes. Often times, corridor studies are undertaken and service levels are usually a consideration. CMS can be helpful in these instances also.

The combination of "special facilities" is infinite. Anyone desiring congestion indices on a unique corridor or route segment need only contact the Data and Statistics Bureau with the location and if needed, any proposed capacity enhancing project information.

For the purpose of this report, only three corridors have been identified for reporting purposes. They are the Camino Real, CANAMEX, and Billings-Great Falls corridors, as shown **in Figure SF-1**. **Figures SF-2** through **SF-4** (see page 63) illustrate the CIs on the Existing network for the current and future years.

Figure SF-1

August 1998



Data and Statistics Bureau

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Special Facilities

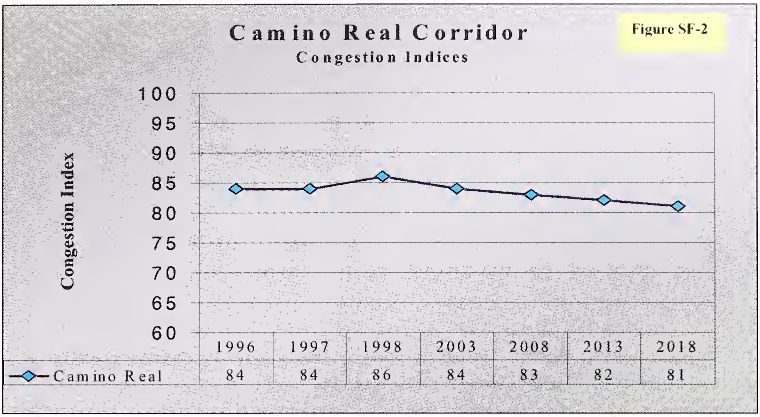


Figure SF-2

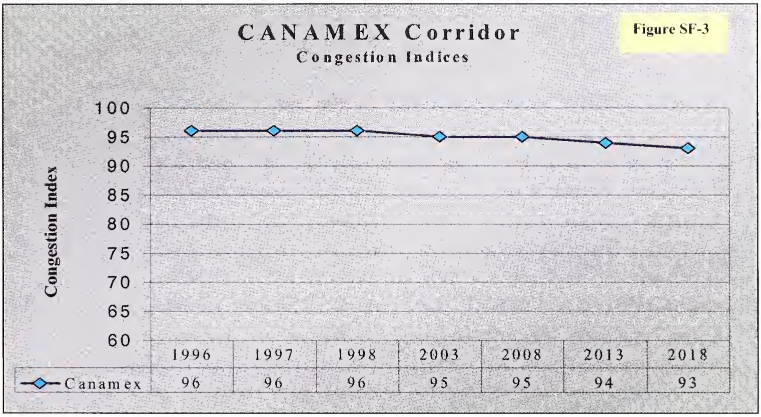


Figure SF-3

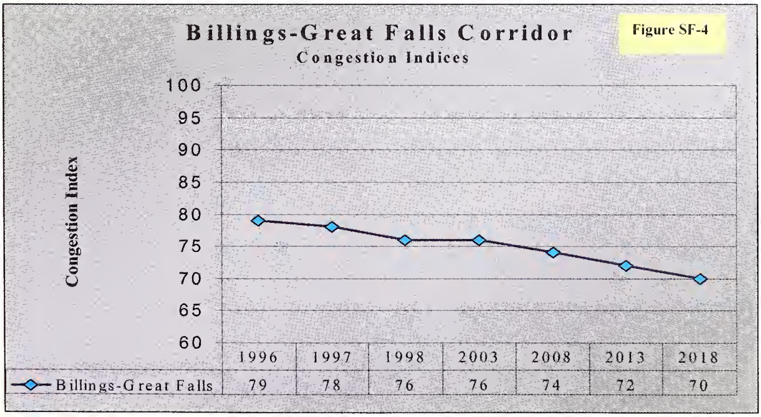


Figure SF-4

Miscellaneous CMS Information

As stated earlier in this report, some of the information needed to calculate CIs on the rural corridors was not available anywhere within the Department. Therefore, the data had to be collected. Previously unavailable data items collected include:

- Lane width
- Shoulder width
- Terrain type
- No pass zone locations

While this data was being collected, staff also seized the opportunity to collect other data items such as rumble strip and access point locations (see page 65) that could be utilized for other purposes within MDT.

The above data items are far from all-inclusive, however, they represent items which can be reported in many different ways and can also be mapped out for informational purposes. Anyone wishing further details on any of these data elements should contact the Data and Statistics Bureau.

As we all know collecting data in a state the size of Montana is very time consuming task. To deal with time constraints and staffing limitations, the Data and Statistics Bureau has embraced the roadway images as an invaluable source of information. But re-shooting the state's highway infrastructure is a Herculean task. The CMS Existing Network as inventoried from the most current images. Bear in mind that the Existing Network portrayed in this report reflects the most current images available and will remain as such until new roadway images are available.

Access Points

August 1998

	Type			
	1	2	3	Total
NI-NHS	3,206	9,859	3,085	**16,150**
Primary	3,074	10,310	4,217	**17,601**
Total	**6,280**	**20,169**	**7,302**	**33,751**

I-94

P-48

▲ Type 1

Type 1 - Consists of junctions of public roads.

● Type 2

Type 2 - Consists of commercial, residential or recreational property accesses. Also includes any other access points that are well constructed and well maintained.

● Type 3

Type 3 - Consists of all other access points such as farm, field accesses.

8

Notes

Urban Corridors

Introduction

The urban corridor portion of the CMS requires a great deal of staff time. In order to perform an analysis, and to keep the urban portion of the CMS program manageable, certain thresholds were set. Only Primary and Non-Interstate NHS routes within Columbia Falls, Whitefish, Glendive and the 14 urban areas will be analyzed. The additional three non-urban cities were chosen for inclusion in the urban corridor portion of the CMS because they have known high volume corridors with "urban-like" characteristics. There are undoubtedly other "urban-like" corridors in non-urban areas, and as they are identified, will be included in future CMS reports as necessary.

Analysis Methodology

Unlike the rural corridor analysis, the urban corridor methodology is not automated. It does not draw from existing databases such as the Roadlog and Traffic files. Because this methodology does not utilize traffic data, it does not have predictive capabilities.

The Computer Aided Transportation Software (CATS) program, developed by the Texas Transportation Institute, was purchased to assist with corridor-level data collection. The software, which utilizes a distance measuring instrument (DMI), records data such as distances, speeds, and travel times.

To perform an analysis, the driver of the test vehicle travels the identified corridor using what is called a 'floating vehicle' technique. The driver attempts to mirror the typical driver by 'floating' with traffic.

As the test car travels the corridor the software records data between pre-defined checkpoints. Delay time data is collected for both the overall route and for the checkpoints. For the urban analysis, MDT staff defined delay as the time from when the test vehicle comes to a stop until it reaches a speed greater than 5 mph. Travel speed, which is defined as the time necessary to travel between any two points, is also collected.

A total of 36 runs were done per corridor. This includes six runs during the AM peak, six during the PM peak and six during the off peak for each direction of travel. The peak periods for each corridor were derived from information provided by the Traffic Data Collection Section.

Just as traffic has peak periods so do the individual urban/urban-like areas. A good illustration in the variation of seasonal traffic would be to compare Kalispell and Bozeman. In Kalispell, a highly recreational area, the peak period is July through August. Bozeman on the other hand has a peak period of September through October. This is likely due to the influx of college students. The peak seasons for each area were identified and the corridor analyses were scheduled to coincide with these peaks.

Results

The CATS program generates a vast amount of raw data that can be processed into graphs and tables. But, for time and space purposes, only samples of that level of detail will be reflected in this report.

In each individual urban section there is a map showing the corridors identified for analysis along with a graph showing the average travel time by peak period. Additional data and results can be provided upon request.

It has been noted that test vehicles were not always giving themselves enough distance from the initial checkpoint to get into the flow of traffic, therefore there is sometimes a noticeable difference between the speed limit and the average travel speed until the test vehicle reached a floating state. Instructions for the test vehicle drivers have been modified to correct this. The same situation occurred when drivers decelerated prior to the final checkpoint to prepare to turn around to begin another run. This collection error has been corrected and will not appear in future results.

Status of Inventory

Due to staffing constraints and the time consuming nature of this project, only four of the identified areas were able to be analyzed. These areas are:

- Anaconda
- Bozeman
- Helena
- Kalispell

The areas identified for analysis in the summer of 2000 are

- Billings
- Glendive
- Laurel
- Lewistown
- Livingston
- Miles City

Each year different areas will be inventoried but due to staffing constraints, areas will be re-visited approximately every four to five years.

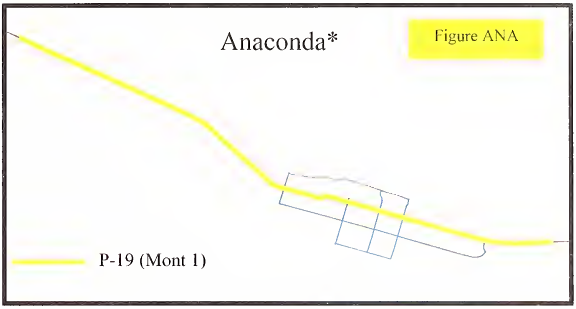
Anaconda

Anaconda

General Information

For reference purposes, **Figure ANA** illustrates the corridor, based on the previously mentioned criteria, identified for analysis in the Anaconda urban area.

Originally, Fourth Street (U0204) was also identified for analysis, but time constraints forced staff to re-evaluate the criteria being used to select routes. It was decided that only Primary and NI-NHS routes would be analyzed.



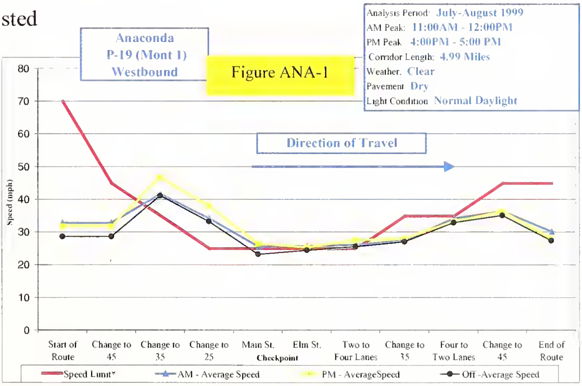
* Urban area boundary information is not yet available in Arcview format

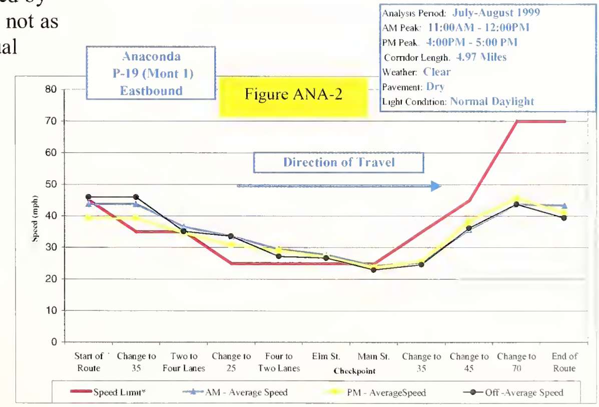
Analysis Results

Figure **ANA-1** compares the posted speed limits and the average travel speed on P-19 for the AM, PM and off peak periods in the westbound direction of travel. **Figure ANA-2** provides the same comparisons for the eastbound direction of travel.

The informational box on the upper right hand side of the graph contains general information about the runs.

The graphs shown here *are not* outputs of the CATS program. While the CATS graphs better portray the acceleration and deceleration of the test vehicle, the graphs produced by CATS, although highly useful, are not as easily read. An example of an actual CATS output is shown in **Figure ANA-3** (see page 69).

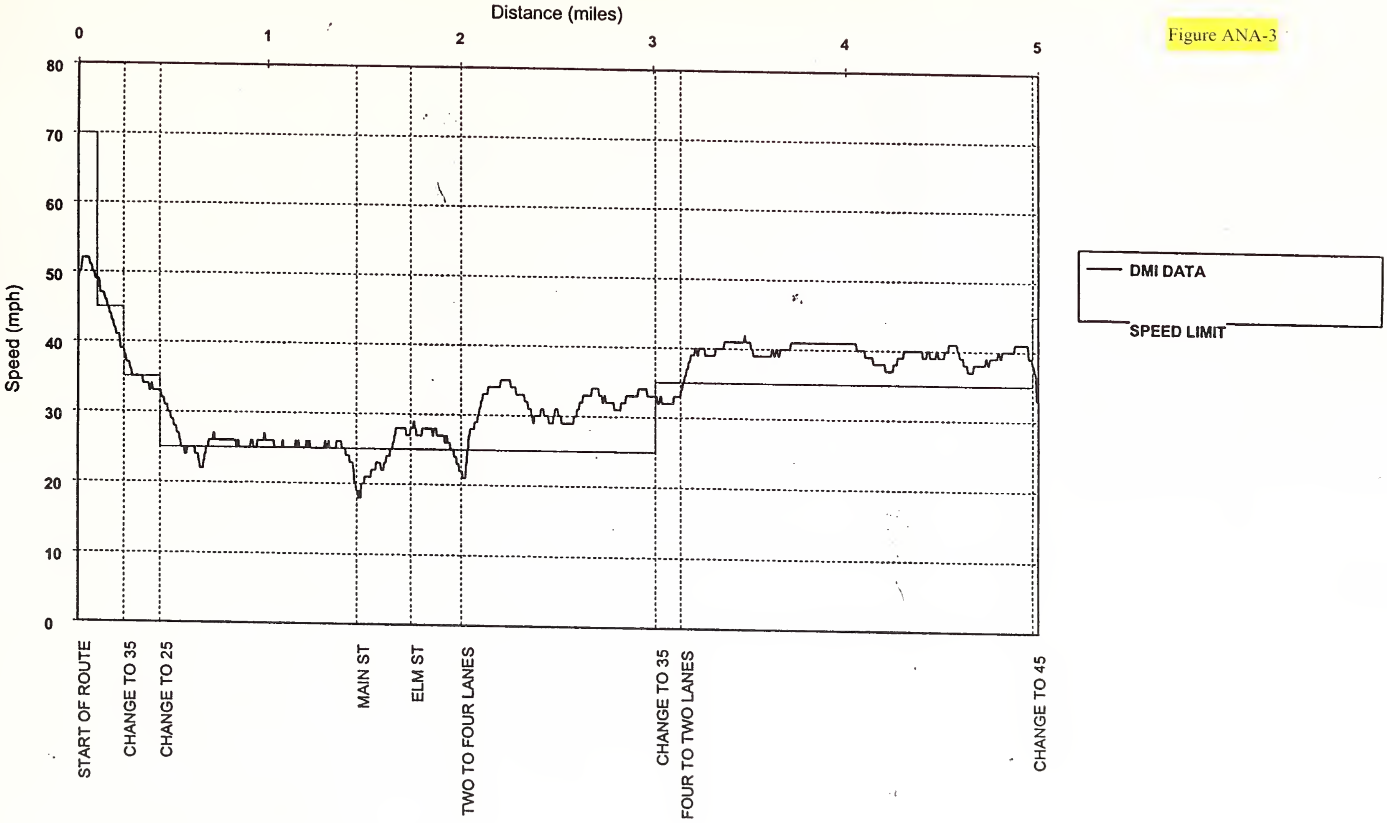




A1AW9H02.11B

MONT 1 ARTERIAL WEST BOUND 8/2/1999 11:05:43 AM

Figure ANA-3



Bozeman

Bozeman

General Information

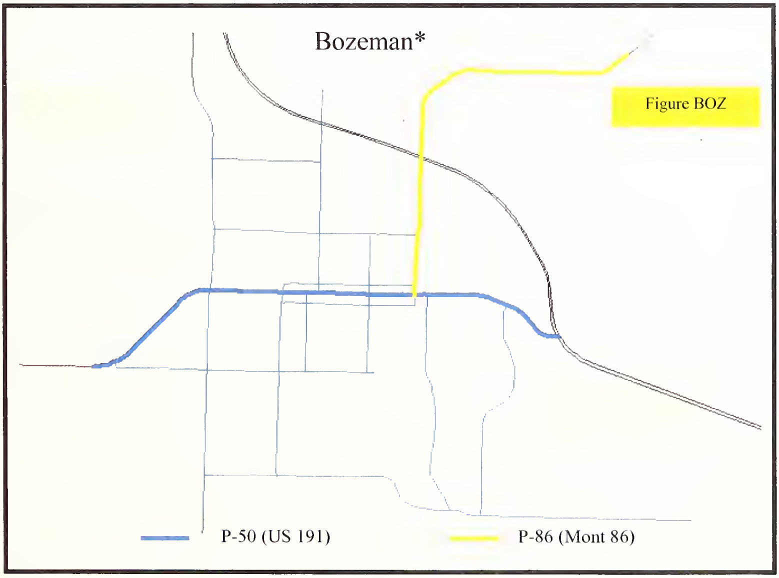
For reference purposes, **Figure BOZ** illustrates the corridors identified for analysis in the Bozeman urban area.

Originally, 19th Ave. (U1201), S. 11th St. (U1203), Durston Rd./ Peach Street (U1204), Mendenhall St./11th Ave. N. (U1206), Babcock St/N. Rouse Ave. (U1208), 7th Ave. (U1207), Willson Ave. (U1209), College St. (U1210), Kagy Blvd./ Bozeman Trail road (U1212), were identified for analysis. Time constraints forced staff to re-evaluate the criteria being used to select routes. It was decided that only Primary and NI-NHS routes would be analyzed.

Analysis Results

Figure BOZ-1 (see page 71) compares the posted speed limits with the average travel speed on P-50 (US 191) for the AM, PM, and off peak periods in the southbound direction of travel. **Figure BOZ-2** (see page 71) provides the same comparisons for the northbound direction of travel. **Figure BOZ-3** (see page 71) compares the posted speed limits with the average speed on P-86 (Mont 86) for the AM, PM, and off peak periods in the southbound direction of travel. **Figure BOZ-4** (see page 71) provides the same comparison for the northbound direction of travel.

Figure BOZ-5 (see page 72) shows an example of the incident data collected by the CATS software. Staff is able to record and display pre-defined incidents such as pedestrian crossings, medians, school zones, etc. along the corridors.



* Urban area boundary information is not yet available in Arcview format

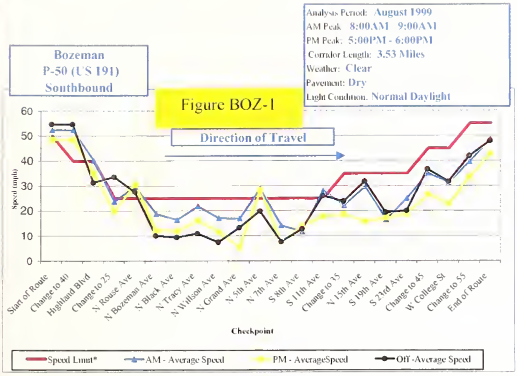


Figure BOZ-1

Analysis Period: August 1999
AM Peak: 8:00AM - 9:00AM
PM Peak: 5:00PM - 6:00PM
Corridor Length: 3.53 Miles
Weather: Clear
Pavement: Dry
Light Condition: Normal Daylight

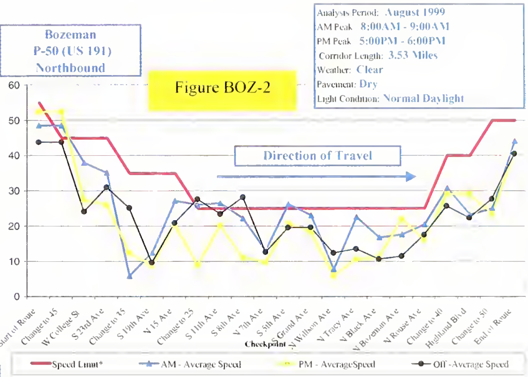


Figure BOZ-2

Analysis Period: August 1999
AM Peak: 8:00AM - 9:00AM
PM Peak: 5:00PM - 6:00PM
Corridor Length: 3.53 Miles
Weather: Clear
Pavement: Dry
Light Condition: Normal Daylight

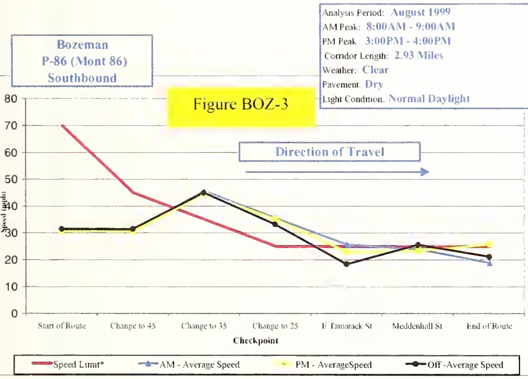


Figure BOZ-3

Analysis Period: August 1999
AM Peak: 8:00AM - 9:00AM
PM Peak: 3:00PM - 4:00PM
Corridor Length: 2.93 Miles
Weather: Clear
Pavement: Dry
Light Condition: Normal Daylight

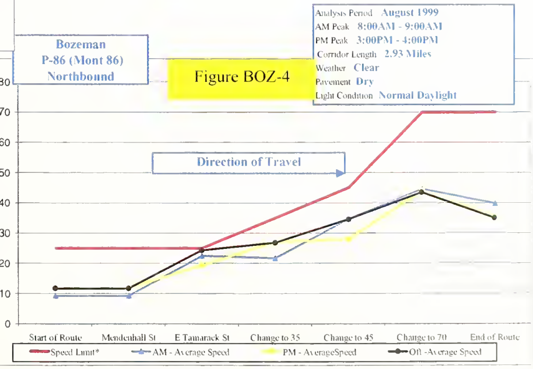


Figure BOZ-4

Analysis Period: August 1999
AM Peak: 8:00AM - 9:00AM
PM Peak: 3:00PM - 4:00PM
Corridor Length: 2.93 Miles
Weather: Clear
Pavement: Dry
Light Condition: Normal Daylight

C1AN9H02.17D

US 191 ARTERIAL NORTH BOUND 8/2/1999 5:18:42 PM

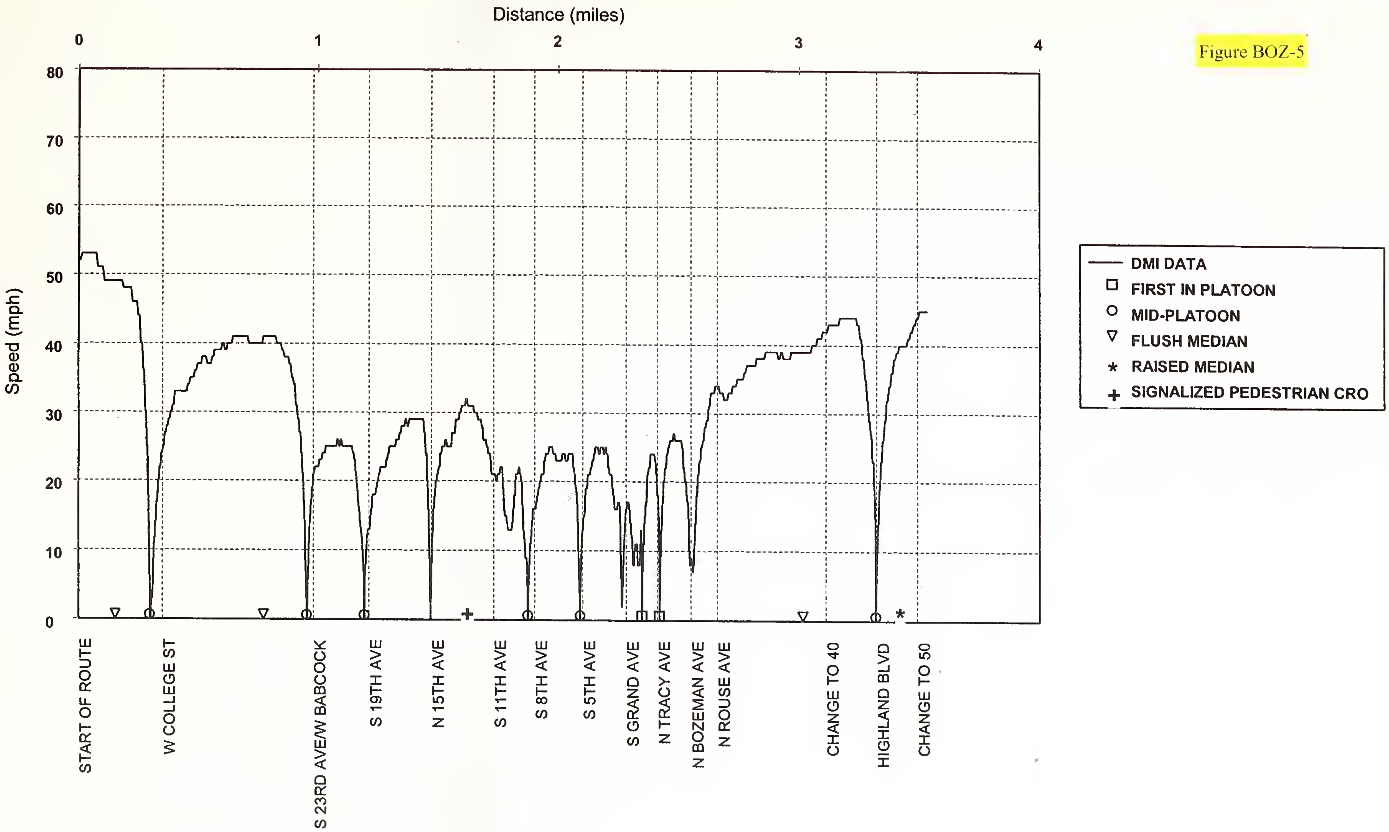


Figure BOZ-5

Helena

Helena

General Information

For reference purposes, **Figure HEL** illustrates the corridors identified for analysis in the Helena urban area.

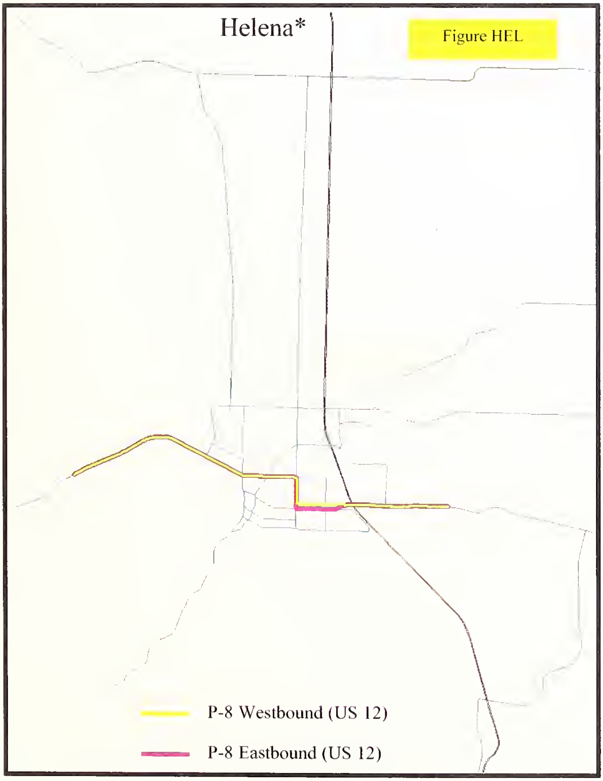
Originally, Montana Ave. (U5809), Custer Ave. (U5802), Benton Ave. (U5805), Main St. (U5807), Neill Ave. (U5812), 6th Ave. (U5814), Broadway (U5816) were identified for analysis. Time constraints forced staff to re-evaluate the criteria being used to select routes. It was decided that only Primary and NI-NHS routes would be analyzed.

Analysis Results

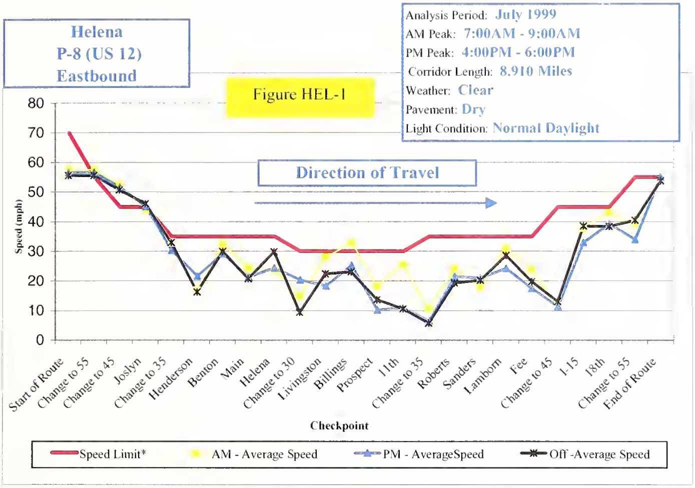
Figure HEL-1 (see page 74) compares the posted speed limits with the average travel speed on P-8 (US 12) for the AM, PM and off peak periods in the eastbound direction of travel. **Figure HEL-2** (see page 74) provides the same comparisons for the westbound direction of travel.

Figure HEL-3 (see page 75) shows an example of the delay data collected by the CATS software. As explained earlier, delay is defined as any time the test vehicle spent under 5 mph. The table reports the delay in seconds for each identified intersection along the P-8 (US 12) westbound corridor for the AM, PM and off peak periods. The delay is reported for each of the six runs and also as an average for the intersection.

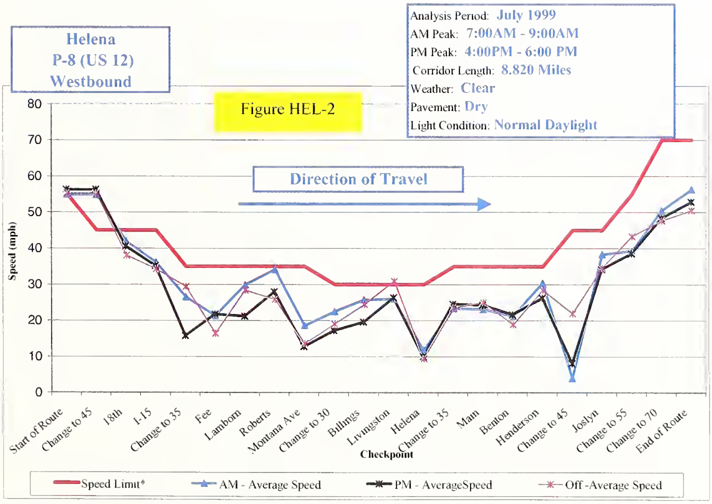
Keep in mind, the delay times shown in the table are *only* for the leg of the intersection the test vehicle traveled through during the analysis. This is not an intersection analysis but it does give a good indication of how long a typical vehicle is delayed at each of the intersections. Similar information is available, upon request, for each of the corridors analyzed.



* Urban area boundary information is not yet available in Arcview format



* Construction first 2 miles of route - 70mph speed limit reduced to 55 mph



* Construction last 2 miles of route - 70mph speed limit reduced to 55 mph

P-8 (US-12)
Westbound

Figure HEL-3

Delay* in Seconds - AM Peak

Run	Intersection												
	18th St.	I-15	Fee St.	Lamborn St.	Roberts St.	Montana Ave.	Billings Ave.	Livingston Ave.	Helena Ave.	Main St.	Benton Ave.	Henderson Ave.	Joslyn Ave.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.87	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.12	18.78	21.75	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	9.89	0.00	0.00	16.82	41.03	36.09	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.34	52.39	0.00	4.44	0.50	0.00
5	0.00	7.91	0.00	0.00	0.00	17.30	0.00	0.00	0.00	39.05	35.10	29.17	0.00
6	0.00	0.00	18.28	0.00	0.00	15.83	0.00	0.00	17.30	0.00	34.10	0.00	0.00
Average	0.00	1.32	3.05	0.00	0.00	7.17	0.00	2.22	19.77	16.48	21.91	6.92	0.00

Delay* in Seconds - PM Peak

Run	Intersection												
	18th St.	I-15	Fee St.	Lamborn St.	Roberts St.	Montana Ave.	Billings Ave.	Livingston Ave.	Helena Ave.	Main St.	Benton Ave.	Henderson Ave.	Joslyn Ave.
1	0.00	24.71	0.00	16.82	0.00	0.00	9.88	0.00	0.00	21.26	0.00	64.24	0.00
2	0.00	0.00	0.00	7.90	0.00	34.12	10.88	0.99	0.00	0.00	40.04	39.05	0.00
3	0.00	0.00	0.00	0.00	28.17	43.99	0.00	0.00	53.88	34.60	44.99	0.00	0.00
4	6.91	0.00	8.90	0.00	0.00	25.21	0.00	0.00	44.99	19.29	9.89	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	10.39	0.00	7.91	41.02	0.00	0.00	0.00	10.87
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.08	0.00	13.84	0.00	0.00
Average	1.15	4.12	1.48	4.12	4.70	18.95	3.46	1.48	29.33	12.53	18.13	17.22	1.81

Delay* in Seconds - Off Peak

Run	Intersection												
	18th St.	I-15	Fee St.	Lamborn St.	Roberts St.	Montana Ave.	Billings Ave.	Livingston Ave.	Helena Ave.	Main St.	Benton Ave.	Henderson Ave.	Joslyn Ave.
1	0.00	20.77	0.00	0.00	13.84	9.88	0.00	0.00	47.44	10.38	29.65	0.00	0.00
2	6.92	0.00	20.77	0.00	0.00	0.00	0.00	0.00	34.11	21.25	29.17	21.25	0.00
3	0.00	0.00	0.00	0.00	17.79	0.00	11.86	0.00	53.88	0.00	66.74	15.85	0.00
4	0.00	0.00	25.20	0.00	0.00	20.77	0.00	0.00	29.65	0.00	10.37	0.00	0.00
5	22.74	0.00	11.37	1.48	0.00	17.31	0.00	0.00	0.00	26.69	4.95	3.95	0.00
6	0.00	15.83	0.00	0.00	11.38	18.29	0.00	0.00	5.93	9.89	30.64	0.00	0.00
Average	4.94	6.10	9.56	0.25	7.17	11.04	1.98	0.00	28.50	11.37	28.59	6.84	0.00

* Delay is defined as the time from when the test vehicle comes to a stop until it reaches a speed greater than 5 mph

Kalispell

Kalispell

General Information

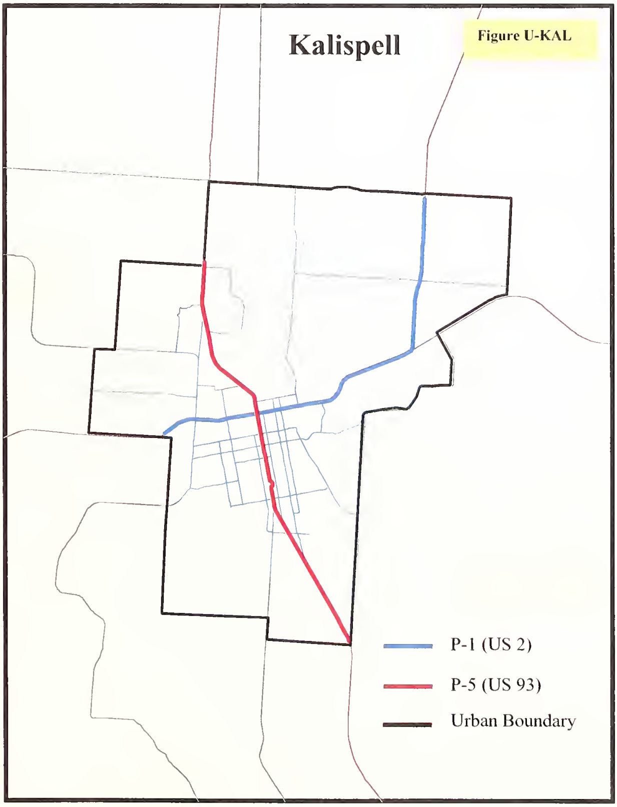
For reference purposes, **Figure U-KAL** illustrates the corridors in the Kalispell urban area that were identified for analysis.

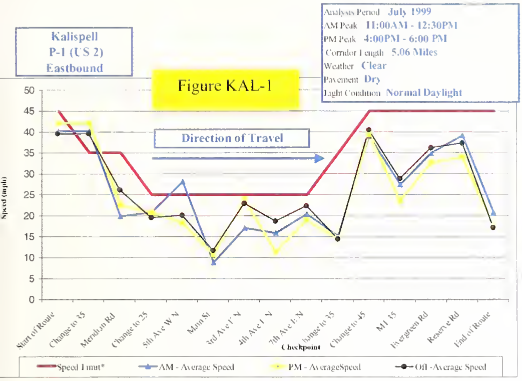
Originally, Meridian Rd. (U6701), Center St. (U6714), 2nd St. – Conrad Dr. (U6715), 11th St. W/E (U6718), 5th Ave. W/N (U6721), 1st Ave. W (U6722), 1st Ave. N/E (U6723), 3rd Ave. N/E (U6724), Woodland Ave. (U6726) were identified for analysis. Time constraints forced staff to re-evaluate the criteria being used to select routes. It was decided that only Primary and NI-NHS routes would be analyzed.

Analysis Results

Figure KAL-1 (see page 77) compares the posted speed limits with the average travel speed on P-1 (US 2) for the AM, PM and off peak periods in the eastbound direction of travel. **Figure KAL-2** (see page 77) provides the same comparisons for the westbound direction of travel.

Figure KAL-3 (see page 77) compares the posted speed limits with the average travel speed on P-5 (US 93) for the AM, PM and off peak periods in the northbound direction of travel. **Figure KAL-4** (see page 77) provides the same comparisons for the southbound direction of travel.

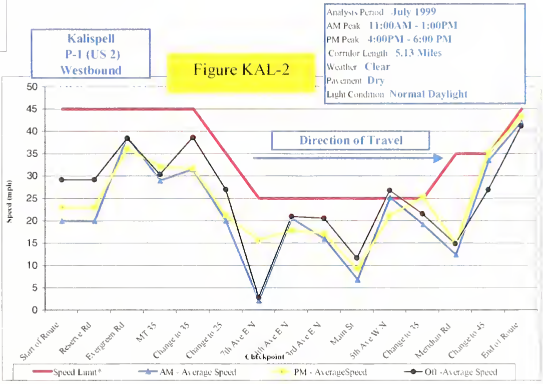




Kalispell
P-1 (US 2)
Eastbound

Figure KAL-1

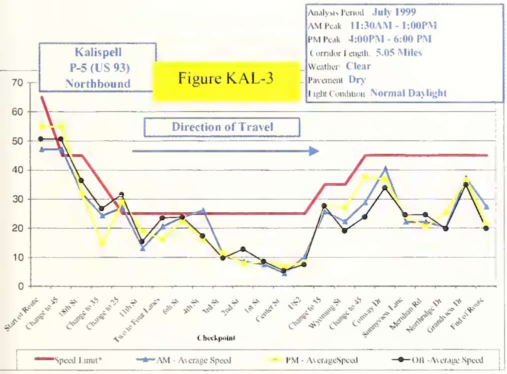
Analysis Period July 1999
AM Peak 11:00AM - 12:30PM
PM Peak 4:00PM - 6:00 PM
Corridor Length 5.06 Miles
Weather Clear
Pavement Dry
Light Condition Normal Daylight



Kalispell
P-1 (US 2)
Westbound

Figure KAL-2

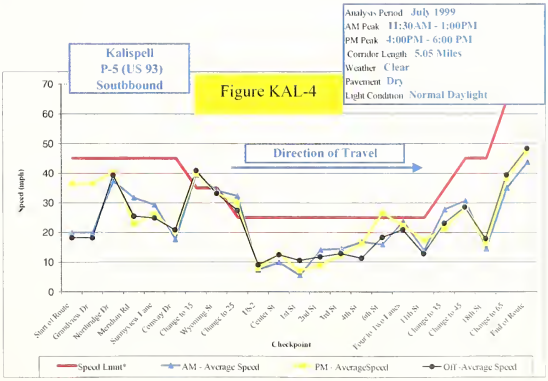
Analysis Period July 1999
AM Peak 11:00AM - 1:00PM
PM Peak 4:00PM - 6:00 PM
Corridor Length 5.13 Miles
Weather Clear
Pavement Dry
Light Condition Normal Daylight



Kalispell
P-5 (US 93)
Northbound

Figure KAL-3

Analysis Period July 1999
AM Peak 11:30AM - 1:00PM
PM Peak 4:00PM - 6:00 PM
Corridor Length 5.05 Miles
Weather Clear
Pavement Dry
Light Condition Normal Daylight



Kalispell
P-5 (US 93)
Southbound

Figure KAL-4

Analysis Period July 1999
AM Peak 11:30AM - 1:00PM
PM Peak 4:00PM - 6:00 PM
Corridor Length 5.05 Miles
Weather Clear
Pavement Dry
Light Condition Normal Daylight

Alternative accessible formats of this
document will be provided upon request.
For further information call:
444-7238 (V) or 444-7696 (T).